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AMERICAN NUMISMATIC SOCIETY
IN MEMORY OF
DAVID M. BULLOWA
MCMXII
MCMLIII

A

CONCISE
INTRODUCTION
TO
Practical Arithmetic;

IN WHICH,

All the Rules that occur in common Business
are applied to the

Federal Currency.

Deſigned for the Uſe of SCHOOLS *in the* UNITED STATES.

By SAMUEL TEMPLE, *A. M.*

Fifth Edition.

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PREFACE

TO THE SECOND EDITION.

THE principal design in publishing the first edition of this work, was to furnish schools in the United States with suitable rules for calculating in federal money. Although federal money was the main object, yet the rules for calculating in lawful money, and many other useful matters, were inserted.

Notwithstanding the care which was taken to render the former edition accurate, some trifling errors have made their appearance; but in this edition they are corrected.

Among the additions made to this edition, I have given a specimen of book-keeping; the knowledge of which is so necessary, that no one ought to be ignorant of it.

To serve the public, by endeavouring to diffuse useful knowledge, is the highest ambition of

THE AUTHOR.

Randolph, Massachusetts, July, 1798.

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A
CONCISE INTRODUCTION
TO
PRACTICAL ARITHMETIC.

ARITHMETIC, *in theory*, is the ſcience of numbers; *in practice*, it is the art of computing or calculating by numbers, in ſuch a manner, as ſhall moſt readily ſerve the various purpoſes of life.

Arithmetic is comprehended in five principal rules, viz. Numeration, Addition, Subtraction, Multiplication, and Diviſion. By the right application of theſe rules, are ſolved all queſtions, in which arithmetic is concerned.

Numeration teacheth to expreſs the value of any number, or quantity, by the ten following characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.——0 is called a cypher or nought; 1 one; 2 two; 3 three; 4 four; 5 five; 6 ſix; 7 ſeven; 8 eight; 9 nine. By the various combination of the foregoing characters, which are called figures or digits, all numbers are expreſſed; and, in any combination of figures, the value of each is determined by the place it occupies, as is ſhowed in the following Table.

Numeration Table.

Billions.	Hund. of thouſ. of mill.	Tens of thouſ. of mill.	Thouſands of millions.	Hundreds of millions.	Tens of millions.	Millions.	Hundreds of thouſands.	Tens of thouſands.	Thouſands.	Hundreds.	Tens.	Units.
8,	4	6	5,	7	3	8,	6	7	5,	4	2	1
				9	8	7,	6	5	4,	3	2	1
					8	3,	5	1	8,	7	3	1
						7,	3	6	0,	8	0	1
							6	4	1,	1	0	0
								5	0,	3	1	2
									4,	0	7	6
										3	2	1
											2	1
												1

Explanation of the foregoing Table.

To enumerate any number of figures, begin at the right hand and proceed to the left.

The firſt right hand figure of any number is called units; the ſecond, tens; the third hundreds; the fourth, thouſands, &c. Each figure, from right to left, increaſes in a ten fold proportion; that is, the ſecond figure from the right hand is ten times the value of the ſame figure in the place of units. The third is ten times the value of the ſecond; the fourth that of the third; and ſo of the reſt.

Example. In the third line of the Numeration Table (counting from the bottom) I find 3, in the place of hundreds, which is *three hundred*; 2, in the place of tens, which is *twenty*; and 1, in the place of units, which is *one*; therefore, the whole value of that line is *three hundred and twenty-one.*

Application.

Write, in figures, the following numbers.

1ſt. Six hundred and twenty-five.
2d. Three thouſand, one hundred and ten.
3d. Forty-five thouſand, two hundred and ſixteen.
4th. Thirty-three thouſand, two hundred and two.
5th. One hundred and twelve thouſand, five hundred.
6th. One hundred thouſand and twenty-nine.
7th. Two million, three hundred and twenty thouſand, five hundred and eleven.
8th. Sixty-nine million, eight hundred and two thouſand, three hundred and five.
9th. Seventy-two million, thirteen thouſand and nineteen.

Write in words each line of the Numeration Table, reſpectively, beginning at the bottom.

ADDITION.

Addition is the collecting of *two* or *more* numbers into *one* ſum; and is both ſimple and compound.

Simple Addition teacheth to collect, into *one* ſum, ſeveral numbers, which conſiſt of one denomination only.

Compound Addition teacheth to find the amount of two or more numbers, which conſiſt of ſeveral denominations.

Simple Addition.

Rule 1*ſt*. Place units under units; tens under tens; hundreds under hundreds, &c.

Rule 2*d.* Begin with the right hand column, or line of units, when two or more numbers are to be added together.

Rule 3*d.* Carry *one* for every *ten*;* that is, in adding the firſt column of any ſum, if it exceed *ten, twenty, thirty, forty,* &c. ſet down what there are *over ten* or *tens,* and carry as many to the ſecond column, as there were tens in the firſt;—thus proceed with each column, till the laſt is added, under which ſet down the whole amount.

Proof. Add each column as before, omitting the top line; ſet this amount under the firſt; then, if the amount of this and the top line be equal to the total ſum, the work is right.

EXAMPLES.

	1	2	3	4
	376	7865	562	8756
	493	3586	173	2108
	102	4321	452	4679
	315	8576	021	6523
	1286			
	910			
Proof.	1286			

In the firſt example, I ſay, five and two are ſeven and three are ten and ſix are ſixteen; I then ſet down what there are over ten, which are ſix, then proceed with the ſecond column thus,—one that I carry to one are two, and nine are eleven, and ſeven are eighteen; I ſet down eight, and carry one to three, which are four, and one are five, and four are nine, and three are twelve; I then ſet down the whole.—In the next place, I add each column as before, omitting the top line, and ſet the amount under that of the whole ſum; laſtly, I add the ſum of all, except the top line, *to* the top line, and find the amount is equal to the whole ſum; therefore, I conclude the work is right.

5 Pounds.	6 Dollars.	7 Miles.
57684	987654	5432176
97680	321098	3879547
35472	765432	3954687
48765	109876	2138786

---

* The reaſon of this is, becauſe the value of each figure from right to left increaſes in a ten fold proportion; that is, ten units, or ones, make *ten*; ten *tens*, an *hundred*; and ten *hundred*, one *thouſand*, &c.

8

8 7 6 9 5 4 3 8 6 5
4 3 8 5 7 9 3 0 8 6
4 7 9 3 7 2 0 8 2 1
1 8 7 3 4 5 9 7 6 3

9

8 9 0 3 5 6 8 5 4 9
1 2 3 4 5 6 7 8 9 0
9 8 7 6 5 4 3 2 1 9
8 7 6 5 4 3 2 1 2 3

Practical Queſtions.

1. A man has four farms. The firſt is worth two thouſand, ſeven hundred and twenty-five dollars ;—the ſecond is worth three thouſand, eight hundred and nineteen dollars ;—the third is worth one thouſand, ſix hundred and ten dollars ; the fourth is worth five hundred and twelve dollars ; what are they all worth ? 8,666 dols. Anſwer.

2. A man has four horſes. The firſt is worth eighty-four dollars ;—the ſecond is worth forty-five dollars ;—the third is worth as much as the ſecond ; and the fourth is worth as much as the firſt ; what are they all worth ?

258 dols. Anſwer.

3. A man poſſeſſes a tract of land, which contains forty-nine thouſand, eight hundred and thirty-five acres ; now, ſuppoſe he had *ſix* tracts of equal dimenſions, how many acres would the whole contain ? 299,010 acres. Anſwer.

4. Suppoſe one ox weigh one thouſand and forty-five pounds ; another, eight hundred and twelve pounds ; and a third, nine hundred and one pounds ; what is their whole weight ? 2,758 pounds. Anſwer.

5. The hind quarters of a cow weigh one hundred and three pounds each ; the fore quarters weigh ninety-ſeven each ; the hide, ſixty-three, and the tallow, fifty-ſix ; what is the weight of the cow ? 519 pounds. Anſwer.

Compound Addition.

Compound Addition teacheth to find the total ſum of two or more numbers, which conſiſt of ſeveral denominations.

Rule 1*ſt.* Each denomination muſt be placed directly under that which is of the ſame name ; that is, farthings muſt be placed under farthings, pence under pence, ſhillings under ſhillings, &c.

Rule 2d. Carry for *ſo many*, in every denomination, as make *one*,* in the next higher denomination.

Proof. In order to prove any ſum in compound addition, proceed in the ſame manner as in ſimple addition.

Before the learner begins to work queſtions in lawful money, it would be well to commit to memory the following Tables.

Pence Tables.

pence		s.	d.
20	are	1	8
30	——	2	6
40	——	3	4
50	——	4	2
60	——	5	0
70	——	5	10
80	——	6	8
90	——	7	6
100	——	8	4
110	——	9	2
120	——	10	0
130	——	10	10
140	——	11	8
150	——	12	6
160	——	13	4

s.		d.
2	are	24
3	——	36
4	——	48
5	——	60
6	——	72
7	——	84
8	——	96
9	——	108
10	——	120
11	——	132
12	——	144
13	——	156
14	——	168
15	——	180
16	——	192

Lawful Money.

4 farthings make 1 penny, marked d.
12 pence —— 1 ſhilling, —— s.
20 ſhillings —— 1 pound, —— £.

Examples.

	1				2			
	£.	s.	d.	q.	£.	s.	d.	q.
	45	8	6	1	898	13	4	3
	38	7	3	2	725	10	9	1
	15	3	4	3	636	14	3	0
	10	4	8	0	543	07	5	3
	109	3	10	2				
	63	15	4	1				
Proof.	109	3	10	2				

---

* This may be illuſtrated by the following obſervation. As there are four farthings in one penny, it is evident that there are as many pence in any number of farthings as there are times four in that number.

Note. The moſt general method of expreſſing farthings, is thus:

¼ one farthing; or one fourth of a penny.
½ two farthings; or half a penny.
¾ three farthings; or three fourths of a penny.

3

£.	s.	d.
856	3	4½
530	9	8
711	11	3¼
317	8	6
2415	12	9¾
1559	9	5¼
2415	12	9¾

4

£.	s.	d.
800	17	9¾
173	14	8½
446	11	7¼
950	13	4

5

£.	s.	d.
87	16	7½
19	13	4¼
75	11	10½
16	1	9

6

£.	s.	d.
3315	19	3¾
701	17	6½
513	12	8½
7310	13	4¼
17	10	5¾

7

£.	s.	d.
418	11	10
510	14	9½
16	4	11¾
3	17	3¼
2	3	2

8

£.	s.	d.
87	19	11¼
55	11	8
90	4	7¾
18	1	2¾
9	5	6½

Queſtions in Lawful Money.

1. A man has four horſes. The firſt is worth eighty-four pounds, fifteen ſhillings and ſix pence; the ſecond is worth forty-eight pounds, thirteen ſhillings and four pence; the third is worth thirty-one pounds, ſix ſhillings and eight pence; the fourth is worth thirteen pounds, eight ſhillings and three pence; what are they all worth? £.178 3 9 Anſwer.

2. A gentleman poſſeſſes land to the value of two thouſand, five hundred and ninety-eight pounds, ſixteen and ten pence;—he has a ſhip worth two thouſand, three hundred and nine pounds, ſix and eight pence;—his notes are valued at eight hundred and twelve pounds, eight and nine pence half penny;—he has caſh to the amount of four hundred and eight pounds, twelve and a penny, three farthings;—what is the man worth? £.6129 4 5¼ Anſwer.

3. Suppoſe I owe to one man, ſixteen pounds, three and four pence, half penny;—to another, twelve pounds, one and ſix pence;—to another, ſeven pounds, eight and two pence, one farthing;—to another, ſixteen ſhillings and eight pence; what is the amount of all my debts? £.36 9 8¾ Anſwer.

4. A gentleman dying, left three children, to whom he bequeathed the following legacies, viz. to the ſecond, he gave five hundred and thirteen pounds, fifteen and ſix pence;—to the third, three hundred and twelve pounds, eighteen and ten pence;—and to the firſt he gave a ſum equal to both the others; what is the ſum of all their portions? £.1653 8 8 Anſwer.

Federal Money.

10 mills*	make	1 cent,	marked	ct.
10 cents	——	1 dime,*	——	dim.
10 dimes	——	1 dollar,	——	dol.
10 dollars	——	1 eagle,	——	E.

EXAMPLES.

1

E.	dol.	dim.	ct.	m.
36	8	5	7	3
15	9	8	6	4
86	5	4	3	2
54	8	9	8	5

2

E.	dol.	dim	ct.	m.
350	7	6	8	7
935	5	7	3	2
543	2	1	0	6
480	9	6	3	8

Note 1. Since every denomination, in the federal currency, increaſes in a ten-fold proportion, all queſtions relating to it are wrought in the ſame manner as thoſe of whole numbers.

Note 2. Although there are *five* denominations in federal money, yet *three* only will be made uſe of in this work, viz. *dollars*, *cents*, and *mills*.

Note 3. In all caſes, when the number of cents is leſs than ten, the ten's place muſt be ſupplied with a cypher.

3

dol.	ct.	m.
345,	25,	6
715,	50,	7
980,	75,	5
253,	60,	0

4

dol.	ct.
85,	05
17,	16
95,	83
12,	33

5

dol.	ct.	m.
55,	87,	3
28,	08,	0
17,	40,	5
38,	05,	0

6

dols.	ct.
384;	50
576,	09
399,	95
800,	08

---

* * According to the original, mills, dimes, are written *milles*, *diſmes*; yet the omiſſion of *e* in *one*, and of *ſ* in the *other*, is, in my opinion, juſtifiable.

Mills are ſeparated from cents, and cents from dollars, by a comma, which denotes that mills are tenth parts of a cent, and cents, hundredth parts of a dollar.

Queſtions in Federal Money.

1. One man is worth one thouſand, eight hundred and thirty-ſix dollars, fifty cents, three mills. Another is worth four thouſand, three hundred and twelve dollars, twenty-five cents, ſeven mills. Another is worth ſeven hundred and eighty dollars, twenty cents. Another is worth one bundred and eighty dollars, ſixteen cents, five mills. What are they all worth? dol. 7109, 12, 5 Anſwer.

2. A man has four notes, ſpecifying the following ſums, viz. Eighty-nine dollars, five cents. Sixty-five dollars, ſeven cents. Twenty-five dollars, ten cents. Four dollars, ſix cents. What is the ſum of all the notes? dol. 183, 28 Anſwer.

3. A merchant buys a bale of cloth for one hundred and nine dollars, ſeventy-five cents. A quantity of ſalt for two hundred and fifty dollars, eight cents. A quantity of ſugar for ninety-five dollars, thirty-three cents, three mills. A cargo of tar for two thouſand, five hundred and eleven dollars, fifty cents. A quantity of flour for two hundred and nine dollars, twenty-five cents, five mills. What did the above goods coſt?
dol. 3175, 91, 8 Anſwer.

Troy Weight.*

24	grains	make	1	penny-weight, marked	pwt.
20	penny-wts.	——	1	ounce,	—— oz.
12	ounces	——	1	pound,	—— ℔.

EXAMPLES.

lb.	oz.	pwt.	gr.
385	8	9	16
137	4	11	8
496	3	10	12
856	6	7	9

lb.	oz.	pwt.	gr.
703	9	5	10
584	3	15	14
857	6	8	13
631	3	5	4

---

* By this are weighed gold, ſilver, jewels, and all liquors.

Avoirdupois Weight.*

16 drams	make	1 ounce,	marked	oz.
16 ounces	——	1 pound,	——	℔.
28 pounds	——	1 quarter of an hundred wt.	——	qr.
4 quarters	——	1 hundred weight,†	——	cwt.
20 hundred	——	1 ton,	——	T.

T.	cwt.	qr.	lb.	oz.	dr.
34	13	1	18	7	5
89	7	3	10	9	11
70	15	0	14	7	4
68	3	1	9	5	7

T.	cwt.	qr.	lb.	oz.	dr.
84	11	2	16	8	10
47	9	2	12	8	6
56	10	1	20	5	9
98	5	0	3	6	2

Apothecaries' Weight.‡

20 grains	make	1 ſcruple,	marked	℈
3 ſcruples	——	1 dram,	——	ʒ
8 drams	——	1 ounce,	——	℥
12 ounces	——	1 pound,	——	℔

℔	℥	ʒ	℈	gr.
346	5	3	0	11
187	8	3	2	12
754	4	5	1	8
211	3	2	1	5

℔	℥	ʒ	℈	gr.
834	6	2	1	12
735	7	2	1	10
534	5	6	2	10
297	3	0	0	15

Cloth Meaſure.

4 nails	make	1 quarter of a yard,	marked	qr.
4 quarters	——	1 yard,	——	yd.
3 quarters	——	1 Ell-Flemiſh,	——	E. Fl.
5 quarters	——	1 Ell-Engliſh,	——	E. E.
6 quarters	——	1 Ell-French,	——	E. Fr.

---

* By this are weighed Iron, Lead, Sugar, and all other articles of a groſs nature.

† An hundred weight is 112 pounds.

‡ The apothecaries' pound and ounce are the ſame with the pound and ounce troy.

NOTE. This is the weight by which apothecaries mix their medicines; but they buy and ſell them by avoirdupois weight.

yd.	qr.	na.
356	2	1
756	1	2
357	3	3
685	0	1
876	2	2
568	1	0
785	0	1

E.Fl.	qr.	na.
84	1	3
75	2	1
86	0	2
57	1	1
89	2	3
78	1	0
53	0	2

E.E.	qr.	na.
35	3	1
76	4	3
93	2	1
75	0	2
50	3	0
68	4	3
77	1	2

E.Fr.	qr.	na.
56	5	3
86	4	2
78	3	0
95	2	1
23	0	2
78	3	3
84	4	1

Long Meaſure.*

3 barley-corns	make	1 inch,	marked in.
12 inches	——	1 foot,	—— ft.
3 feet	——	1 yard,	—— yd.
$5\frac{1}{2}$ yards, or $16\frac{1}{2}$ feet	——	1 rod, pole or perch,	—— rod.
40 rods	——	1 furlong,	—— fur.
8 furlongs	——	1 mile,†	—— mile.

mile.	fur.	rod.	yd.	ft.	in.	bar.
68	5	30	$4\frac{1}{2}$	1	7	2
78	3	10	3	2	5	1
85	6	29	4	0	9	1
79	6	20	$1\frac{1}{2}$	1	4	1

mile.	fur.	rod.	yd.	ft.	in.	bar.
86	6	25	3	0	8	1
57	2	15	$2\frac{1}{2}$	1	4	2
86	4	35	4	2	7	0
78	5	5	$3\frac{1}{2}$	2	5	1

The Surveyor's Chain is thus divided.

$7\frac{92}{100}$	inches	make	1 link.
25	links	——	1 pole, or rod.
100	links	——	1 chain.
10	chains	——	1 furlong.
8	furlongs	——	1 mile.

---

* Long meaſure is applied to things where length is conſidered, without regard to breadth.

† 60 geometrical miles, or 69 and an half ſtatute miles, make one degree of the earth's circle, and 360 degrees make a great circle of the earth.

NOTE. 4 inches make a hand, and 5 feet a geometrical pace.

Square Meaſure. *

144 ſquare inches make 1 ſquare foot.
9 —— feet —— 1 —— yard.
30¼ —— yards —— 1 —— rod.
160 —— rods —— 1 —— acre.

A.	rod.	yd.	ft.	in.
340	90	25	5	100
563	70	5¼	4	40
739	49	12	4	19
657	23	8	2	4

A.	rod.	yd.	ft.	in.
865	30	18	3	72
873	90	10	6	25
940	50	14	7	15
386	14	2¼	0	72

Cubic, *or* Solid Meaſure. †

1728 cubic inches make 1 cubic foot.
27 cubic feet —— 1 cubic yard.
40 feet of round timber, or 50 feet of hewn timber —— 1 ton.
128 ſolid feet, that is, 8 feet in length, 4 in breadth, and 4 in height —— 1 cord of wood.

yd.	ft.	in.
340	13	1312
748	9	716
537	10	1012
681	12	120

yd.	ft.	in.
85	15	185
97	7	359
45	12	401
29	6	184

yd.	ft.	in.
37	12	94
77	11	88
35	14	79
67	4	56

Wine Meaſure. ‡

4 gills make 1 pint, marked pts.
2 pints —— 1 quart, —— qts.
4 quarts —— 1 gallon, —— gal.
63 gallons —— 1 hogſhead, —— hhd.

---

* Square meaſure is applied to things which have length and breadth without regard to thickneſs, or depth.

† Cubic meaſure is applied to things which have length, breadth, and thickneſs.——Note. A cube is a body conſiſting of ſix equal ſides.

‡ All diſtilled ſpirits, cider, vinegar, oil, &c. are ſold by wine meaſure.

hhd.	gal.	qts.	pts.	gill.
350	40	3	1	2
185	23	1	1	1
986	17	2	0	3
456	13	1	1	0

hhd.	gal.	qts.	pts.	gill.
174	33	2	1	3
517	30	3	0	2
785	28	1	1	1
953	10	0	0	1

Ale, *or* Beer Meaſure.*

2 pints	make	1 quart.
4 quarts	——	1 gallon.
54 gallons	——	1 hogſhead.

hhd.	gal.	qts.	pts.
340	10	2	1
479	35	1	0
247	16	3	1
855	18	1	0
378	11	0	1
485	10	3	1

hhd.	gal.	qts.	pts.
485	24	3	0
387	15	2	1
875	14	1	1
730	16	3	0
856	10	1	1
526	13	0	1

Time.

60 ſeconds	make	1 minute,	marked	m.
60 minutes	——	1 hour,	———	h.
24 hours	——	1 day,	———	d.
7 days	——	1 week,	———	w.
4 weeks	——	1 month,	———	mo.
13 lunar months, or 12 ſolar months	——	1 year,†	———	yr.

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* The beer gallon contain 282, and the wine gallon 231 cubic, or ſolid inches.

Milk is ſold by the beer quart.—Note. 8 quarts make 1 peck; 4 pecks, or 32 quarts, 1 buſhel.

† According to our calendar,‖ 365 days make a year; but the true ſolar year, or the time in which the earth performs one complete revolution round the ſun, is 365 days, 5 hours, 48 minutes, 57 ſeconds. For this reaſon one day is added to February every fourth year, which is called Biſextile or leap year.

‖ Thirty days hath September,
April, June, and November;
February twenty-eight alone,
And all the reſt have thirty-one.

d.	h.	m.	s.
3	16	45	15
5	4	10	20
6	4	5	25
4	13	15	45

w.	d.	h.	m.
2	5	18	50
1	3	3	15
3	6	7	12
0	4	3	30

yr.	mo.	w.
75	8	3
79	9	1
35	3	2
48	7	0

yr.	mo.	w.	d.	h.	m.	s.
340	9	3	6	18	57	35
517	4	1	3	6	3	25
876	7	2	5	12	40	57
384	6	2	0	12	20	15
256	3	0	3	7	19	8

SUBTRACTION.

SUBTRACTION teaches to find the difference between any two numbers, by taking the *leſs* from the *greater*; and is both Simple and Compound.

Simple Subtraction

Teaches to find the difference of two numbers, which are of one name or denomination.

RULE 1*ſt*. Place the greater number uppermoſt, and the leſs directly under it, ſetting units under units, tens under tens, &c.

RULE 2*d*. Having properly ſtated the queſtion, draw a line underneath; then, beginning with units, ſubtract, or take the leſs number from the greater, and ſet down the remainder, or difference.

RULE 3*d*. Borrow *ten*; that is, whenever the lower figure happens to be greater than the upper, *add ten* to the upper figure, and ſubtract the lower figure therefrom, and ſet down the remainder, always remembering, when you borrow in one place, to carry one to the next.

PROOF. Add the difference of two numbers to the leaſt number; if the amount be equal to the greateſt number, the work is right.

EXAMPLES.

	1	2	3
From	5 2 3 6 5	8 7 5 4 3	7 8 5 6 7
Take	1 5 4 2 3	3 1 0 2 4	3 2 7 8 5
Difference	3 6 9 4 2		
Proof	5 2 3 6 5		

In the firſt example, I ſay, three from five there remain two, which I ſet down ; then, two from ſix, there remain four ; then, four from three, I cannot, but four from thirteen, there remain nine ; then, one to carry to five are ſix, ſix from two I cannot, but ſix from twelve, ſix remain ; then, one to carry to one are two ; two from five, three remain. I then draw a line, and add the remainder, or difference of the two numbers in the queſtion, to the leaſt number, or number ſubtracted ; the amount of which, being equal to the greateſt number, ſhows the work to be right.

4	5	6
8 3 5 4 7 8	7 0 4 5 8 0	9 0 0 0 0 0
5 4 3 0 6 8	0 8 5 7 4 3	0 9 8 7 6 5

7	8
4 8 7 5 6 8 5 3 4 7	9 8 7 6 5 4 3 2 1 0
3 7 7 5 6 8 5 3 4 8	0 1 2 3 4 5 6 7 8 9

Application.

1ſt. Subtract two thouſand, one hundred, and nineteen, from five thouſand, two hundred, and twelve. 3093 Anſwer.

2d. A man is worth five thouſand, eight hundred pounds ; but, he owes three hundred and forty-eight pounds ; how much is he worth when his debt is paid ? £.5452 Anſwer.

3d. What is the difference between nine, and ninety-nine million ? 98999991 Anſwer.

4th. If one be taken from ten thousand, what will then remain ? 9999 Anſwer.

5th. A gentleman poſſeſſed fifteen thouſand, eight hundred, and forty acres of land; but, he ſold two thouſand, three hundred, and fifty to one man;—four thouſand, five hundred to another;—and, three thouſand, two hundred, and twenty-five to a third;—how much had he left? 5765 Anſwer.

Compound Subtraction.

Compound Subtraction teacheth to find the difference between two ſums of ſeveral denominations.

Rule 1ſt. Place the two ſums in ſuch a manner, as that each denomination may ſtand directly under that of the ſame name; the *greater* ſum being above the *leſs*. Subtract the *leſs* ſum from the *greater*, beginning with the loweſt denomination, and ſet down the difference.

Rule 2d. Borrow in all denominations, the *ſame*, for which you carried, in Compound Addition.

Lawful Money.

1

	£.	s.	d.	q.
From	785	18	9	3
Take	357	14	7	1
Remain	428	4	2	2
Proof	785	18	9	3

2

	£.	s.	d.	q.
Borrowed	37	10	6	1
Paid	13	14	9	3
Remain	23	15	8	2
Proof	37	10	6	1

Note. In caſe of borrowing, you may ſubtract the *lower number* from the *number borrowed*, and, to the difference, add the upper number; which is the ſame as *adding* the number borrowed to the *upper number*.

3

£.	s.	d.	q.
8370	9	3	0
1987	8	4	3

4

£.	s.	d.	q.
5911	13	10	2
2598	17	11	3

5

£.	s.	d.
835	12	4½
516	16	2¾
318	16	1¾
835	12	4½

6			7			8			9		
£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
89	11	3¼	100	3	6	380	5	7¾	6753	1	10¼
33	13	4½	57	14	8½	197	15	8	308	12	11½

Federal Money.

The federal currency is of ſuch nature, that all queſtions reſpecting it, whether in Addition, Subtraction, Multiplication, or Diviſion, are wrought in the ſame manner as thoſe of whole numbers.

EXAMPLES.

	1	2	3
	dol. cts. m.	dol. cts. m.	dol. cts. m.
From	485, 50, 7	584, 16, 3	87, 87, 4
Take	379, 75, 5	199, 25, 5	58, 66, 8
Remain	105, 75, 2		
Proof	485, 50, 7		

	4	5	6
	dol. ct.	dol. ct. m.	dol. ct. m.
Lent	7858, 95	340, 12, 5	850, 05, 3
Received	3899, 75	149, 20, 0	98, 07, 6

Practical Queſtions in LAWFUL *and* FEDERAL MONEY.

1ſt. A man borrows twenty-nine pounds, thirteen ſhillings, and four pence half penny ; he pays nineteen pounds, fifteen ſhillings, and ſix pence three farthings ; how much remains unpaid ? £.9 17 9¾ Anſwer.

2d. A man borrows one thouſand, three hundred, eighteen dollars, twenty five cents, five mills ; but he pays five hundred and eighty-nine dollars, ſeventy-five cents, five mills ; how much remains unpaid ? dols. 728, 50 Anſwer.

3d. Subtract nine pence half penny, from thirty-five pounds. £.34 19 2½ Anſwer.

4th. Subtract five mills from twenty-four thouſand dollars. dols. 23999, 99, 5 Anſwer.

5th. What is the difference between one farthing and a thouſand pounds? £.999 19 11$\frac{3}{4}$ Anſwer.

6th. A man is worth fourteen thouſand, five hundred and ſixty pounds, ſixteen ſhillings, and four pence; but he owes one man, two thouſand three hundred and forty-ſix pounds, ten ſhillings, and eight pence; to another, three thouſand five hundred and nine pounds, eighteen, and ten pence half penny; and, to a third, eight hundred and ſixteen pounds, fourteen, and five pence half penny; how much will he have left after his debts are paid? £.7887 12 4 Anſwer.

7th. A man borrows, at one time, ſixty-nine dollars, twenty-five cents; at another, forty-five dollars, forty cents; and, at another, thirty-ſeven dollars, ſeventy-five cents. He pays, at one time, twenty-eight dollars, twenty cents; at another, thirty-nine dollars, twenty-five cents; and, at another, forty-five dollars. What ſum is ſtill due? dols. 39, 95 Anſwer.

Troy Weight.

lb.	oz.	pwt.	gr.
875	6	14	19
387	9	16	15

lb.	oz.	pwt.	gr.
724	3	5	7
175	8	13	15

Subtract twelve grains, fifteen pwt. eight ounces, nineteen pounds, from forty-ſix pounds, two ounces, three pwt. eight grains. 26 ℔ 5 oz. 7 pwt. 20 gr. Anſwer.

Avoirdupois Weight.

T.	cwt.	qr.	lb.	oz.	dr.
45	12	2	23	9	7
17	14	3	25	8	9

T.	cwt.	qr.	lb.	oz.	dr.
18	17	1	18	12	13
5	17	1	18	12	15

Subtract eight drams, ten ounces, from nine tons, one quarter. 9 T. 0cwt. 0qr. 27 ℔ 5oz. 8dr. Anſwer.

Apothecaries' Weight.

℔.	℥	ʒ	℈	gr.
89	5	4	1	11
38	10	5	2	13

℔.	℥	ʒ	℈	gr.
78	9	3	0	12
19	9	6	1	7

Suppoſe I buy fifteen pounds, five ounces, three drams, one ſcruple, thirteen grains; and ſell ten pounds, eleven ounces, ſix drams, two ſcruples, eighteen grains of the ſame; what have I left? 4℔. 5℥ 4ʒ 1℈ 15 gr. Anſwer.

Cloth Meaſure.

yd.	qr.	na.
335	1	2
179	2	3

E.Fl.	qr.	na.
98	1	0
59	2	3

E.E.	qr.	na.
74	3	1
61	3	2

E.Fr.	qr.	na.
88	4	2
18	5	3

What is the difference between three nails and twenty-five yards? 24yds. 3qr. 1 na. Anſwer.

Long Meaſure.

mile.	fur.	rod.	yd.	ft.	in.	bar.
35	4	20	3½	1	4	1
27	5	38	4	2	9	0

mile.	fur.	rod.	yd.	ft.	in.	bar.
17	5	12	4	0	8	2
8	5	30	3½	1	10	1

Subtract two barley-corns, one foot, twenty rods, three miles, from eight miles, two furlongs, one yard, nine inches.

5 miles 1 fur. 20 rods 0 yd. 2 ft. 8 in. 1 bar. Anſwer.

Square Meaſure.

A.	rod.	yd.	ft.	in.
340	100	21¼	5	110
187	156	29	8	134

A.	rod.	yd.	ft.	in.
48	29	15	4	123
36	30	25¼	5	124

A man has two farms. The firſt contains three hundred and forty acres, ſeventy-five rods; the ſecond contains eighty-two acres, ninety rods; how much more is the firſt than the ſecond? 257 A. 145 rod. Anſwer.

Wine Meaſure.

hhd.	gal.	qts.	pts.	gill.	hhd.	gal.	qts.	pts.	gill.
387	35	2	1	2	845	15	1	0	1
158	59	3	0	3	267	50	2	1	2

Bought a caſk of brandy containing fifty-five gallons, two quarts; ſold twenty-eight gallons, one pint, two gills of the ſame; how much remains unſold? 27gal. 1qt. 0pt. 2gill. Anſ.

Beer Meaſure.

hhd.	gal.	qts.	pts.	hhd.	gal.	qts.	pts.
487	18	2	0	549	13	1	1
287	51	3	1	451	48	2	0

What is the difference between one pint, and one hundred and thirty-five hogſheads? 134 hhd. 53 gal. 3 qts. 1 pt. Anſ.

Time.

yr.	mo.	w.	d.	h.	m.	s.	yr.	mo.	w.	d.	h.	m.	s.
75	8	2	5	15	45	57	36	10	3	4	12	10	15
48	11	3	5	16	47	59	19	12	3	6	18	50	20

Suppoſe a man let himſelf to work five years; but ſtays only three years, nine months, one week, four days; how long before his time is out does he go away? 1 yr. 3 mo. 2 w. 3 d. Anſ.

2d. Subtract forty-five minutes, fifteen ſeconds, from ten years. 9 yr. 11 mo. 3 w. 6 d. 23 h. 14 m. 45 s. Anſwer.

Multiplication Table.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Multiplication is the increaſing of any number, by *ſo many* of itſelf, as there are units in *that* number by which it is increaſed, or multiplied.

Multiplication is both ſimple and compound.

Simple multiplication teacheth to multiply any two numbers into each other, which are of one denomination.

In multiplication, there are three things to be conſidered, viz.

1ſt. The multiplicand, or number to be multiplied.

2d. The multiplier, or number to multiply by.

3d. The product, which is the reſult of two numbers whe multiplied together, and is the anſwer to the queſtion.

Rule. Place the multiplicand (which is commonly the largeſt number) uppermoſt, and the multiplier underneath ſetting units under units, tens under tens, &c. then draw a line, and proceed to multiply, beginning with units, and ſet down the product, obſerving to carry *one* for every *ten*, as in Simple Addition.

PROOF. Multiplication may be proved, 1ſt, by inverting the order of the multiplier and multiplicand; that is, make the multiplicand the multiplier, and proceed to multiply in the uſual way; the product being like to the product before the queſtion was inverted, ſhows the work to be right. 2d, by dividing the product by the multiplier; the quotient being equal to the multiplicand, ſhows the work to be right.* But, the moſt ready method of proving multiplication, is, by caſting out the nines,† thus: 1ſt, caſt the nines out of the multiplicand, and ſet the overplus at the right hand of a croſs, as you ſee in the example. 2d, caſt the nines out of the multiplier, and ſet the remainder at the left hand of the ſame. 3d, multiply the figures at the right and left of the croſs together, caſt the nines out of their product, and ſet the remainder a-top. Laſtly, caſt the nines out of the product, and ſet the remainder at the bottom; if the top and bottom figures are alike, the work is ſuppoſed to be right.

EXAMPLE.

4834 Multiplicand.
232 Multiplier.

9668
14502
9668

1121488 Product.

Proof. $\begin{array}{ccc} & 7 & \\ 7 & \times & 1 \\ & 7 & \end{array}$

CASE I. When the multiplier does not exceed 12, multiply each figure of the multiplicand by the multiplier, beginning with units, and ſet the product in one line, placing the unit figure of the product directly under the unit figure of the multiplier.

	1	2	3	4
	54378	95687	34625	58635
	2	3	4	5
Product.				

---

[*] As it is ſuppoſed the learner is not acquainted with diviſion, he cannot, at firſt, put this method in practice.

[†] A queſtion may prove by this method, when the work is not right; but, this will not happen, unleſs there are two wrong figures in the work, one of which muſt be juſt as much too large as the other is too ſmall, which is rarely the caſe.

5	6	7
27968	33445	78654
6	7	8

8	9	10
98765	43219	486754857
9	10	11

11	12
375658978	85679437956843
12	9

Case II. When the multiplier is any number over 12, multiply each figure of the multiplicand by each figure of the multiplier, reſpectively; ſet the firſt figure of each product directly under *that* by which you are multiplying; laſtly, add the ſeveral products together, the ſum will be the whole product.

	1	2	3
	85732	38697	18754
	24	18	38
	342928		
	171464		
Prod.	2057568	696546	712652

	4	5	6
	51283	73126	54302
	54	72	96
Prod.	2769282	5265072	5212992

7	8	9	10
30578	58974	14065	875436
323	414	894	4334

11	12	13
875032	754382	354314
2462	33452	99999
		35431045686

Case III. When there are cyphers at the right hand of the multiplier, place the firſt ſignificant figure of the multiplier under the unit figure of the multiplicand, &c. multiply by the ſignificant figures only, and bring down the cyphers at the right hand of the product.

	1	2	3
	485	8357	3786
	240	1200	3600
	19400		
	970		
Pro.	116400	10028400	

4	5
58634	370584
953000	639000

Case IV. When there are cyphers between the ſignificant figures of the multiplier, omit them, and multiply by the ſignificant figures only; obſerving to ſet the firſt figure of each product under that by which you are multiplying.

	1	2	3
	38574	85743	53468
	405	7006	30403
		514458	
		600201	
Prod.		600715458	

4	5	6
378546	7563	47659
40054	8070	3602

Case V. When there are cyphers at the right hand of the multiplicand and multiplier both, place the ſignificant figures of the multiplier directly under thoſe of the multiplicand; multiply the ſignificant figures only, and bring as many cyphers to the right hand of the product, as there are in the multiplicand and multiplier both.

	1	2
	378500	85743000
	34000	385000
	15140	
	11355	
Prod.	128690000000	

3	4
573480000	385620700
30560	6803000

Case VI. To multiply by 10, 100, 1000, 10000, &c. place the cyphers in the multiplier at the right hand of the multiplicand, and the work is done.

Examples.

Multiply 3857, by 10.	38570 Anſwer.
Multiply 895, by 100.	89500 ditto.
Multiply 573, by 1000.	573000 ditto.
Multiply 987, by 10000.	9870000 ditto.
Multiply 80759, by 100.	8075900 ditto.
Multiply 10000, by 1000.	10000000 ditto.

Practical Queſtions.

1ſt. Multiply four hundred and eighty-five by two hundred and forty. 116400 Anſwer.

2d. Suppoſe an orchard contain three hundred and thirteen trees, and each tree produce fifteen buſhels of apples; how many buſhels will the whole orchard produce? 4695 Anſ.

3d. How many ſquares of glaſs are there in an hundred and twenty-four windows, each window containing forty ſquares? 4960 Anſwer.

4th. Suppoſe a regiment, conſiſting of three hundred and ſixty men, be employed four months, each man to receive at the rate of nine dollars per month; what ſum of money will pay the whole regiment, at the end of the time? 12960 dol. Anſ.

5th. A man owns ſeventeen houſes, each houſe is valued at four hundred and ninety-ſix pounds; what are they all worth? £.8432 Anſwer.

6th. Multiply three hundred ſeventy-eight thouſand, five hundred, by thirty-four thouſand. 12869000000 Anſwer.

7th. A man ſells a farm containing three hundred and fourteen acres, for twenty-five dollars per acre; what does the whole farm amount to? 7850 dol. Anſ.

DIVISION.

Division teacheth to find how often one number is contained in another; or, to ſeparate any number, or quantity, into any number of equal parts; and is both ſimple and compound.

Simple Diviſion

Teacheth to divide one number by another, each of which muſt be of only one denomination.

Diviſion conſiſts of four parts, viz.

1ſt. The Dividend, or number to be divided.

2d. The Diviſor, or number to divide by.

3d. The Quotient which is the anſwer to the queſtion, and ſhows the number of times the diviſor is contained in the dividend.

4th. The Remainder;* which is of the ſame name with the dividend, and is always leſs than the diviſor.

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* The remainder is very uncertain, there ſometimes being one, and ſometimes none.

Note. The remainder, after dividing, is always the numerator to a proper fraction, the diviſor being the denominator. This fractional part belongs to the quotient.

Proof. Multiply the diviſor and quotient together, and add in the remainder (if there be any) to the product, which, if the work be right, will be a ſum equal to the dividend.

Rule. Having properly ſtated the queſtion, firſt, inquire how many times the diviſor is contained in a certain number of the firſt left hand figures of the dividend, (which figures *alone* muſt be a ſum *at leaſt* equal to the diviſor,) which being aſcertained, place the figure in the quotient: then, multiply the diviſor by the quotient figure, and ſet the product directly under that portion of the dividend which you divided, and ſubtract it therefrom; to the right hand of the remainder, bring down the next figure of the dividend, and inquire how many times the diviſor is contained in that number; when found, place the figure in the quotient as before, and multiply the diviſor by it, and ſet the product under the laſt divided number; ſubtract as before, and to the remainder bring down the next figure of the dividend; thus proceed, till every figure of the dividend is brought down.

Note. If, after a figure is brought down, the number be *leſs* than the diviſor, place a cypher in the quotient, and bring down another figure.

Example.

```
Diviſor.  Divid.    Quotient.
  2 4)7  8  1  6(3  2  5        Proof.    325 Quotient.
      7  2                                 24 Diviſor.
      ----                                ----
         6  1                             1300
         4  8                             650
         ----                             ----
         1  3  6                          7800
         1  2  0                            16 Remainder.
         -------                          ----
            1  6 Remainder.               7816 Dividend.
```

In the above example, I firſt inquire how many times twenty-four there are in ſeventy-eight, which I find to be three; I then place 3 in the quotient, and multiply the diviſor 24, by it, and place the product 72, under 78, the number divided; I then ſubtract 72 from 78, and find the remainder to be 6; I then bring down the next figure of the dividend, which is 1, and inquire how many times 24 there are in 61, which being found, I place the figure in the quotient as before; I proceed in the ſame manner, till every figure of the dividend is brought down. Then, to prove the work, I multiply the quotient and diviſor together; and, to the product, add the remainder 16; the ſum, being equal to the dividend, ſhows the work is right.

1
3)5478(1826
3
24
24
7
6
18
18

2
4)6538(1634
4
25
24
13
12
18
16
2

3
5)7865(1573
5
28
25
36
35
15
15

4
6)45873(

5
7)95864(

6
9)12853(

7
12)35786(

8
15)93758(

9
18)19537(

10
24)75863(

11
48)15857(

12
85)98765(

13
123)29857(

14
479)59076(

15
577)89654(

16
1796)485987(

17
8938)5957600(

Case II. When there are cyphers at the right hand of the diviſor, cut them off; likewiſe cut off the ſame number of figures from the right hand of the dividend, and proceed to divide as in the firſt caſe.

Note. The figures which were cut off from the dividend, muſt be placed at the right hand of the remainder.

Examples.

1
36|0)146|9(4
144
29 rem.

2
24|00)1059|12(44
96
99
96
312 rem.

3
5|00)637|54(

4
85|00)987|50(

5
38|000)78765|800(

6	7
8598|00)84567|85(	378|0)48569|7(

Case III. To divide by 10, 100, 1000, 10000, &c. cut off ſo many figures from the right hand of the dividend as there are cyphers in the diviſor ; the figures cut off will be the remainder, and the left hand figures will be the quotient.

Examples.

	quot.	rem.	
Divide 7898, by 10.	789	8	Anſwer.
Divide 3874, by 100.	38	74	ditto.
Divide 7586, by 1000.	7	586	ditto.
Divide 398765, by 10000.	39	8765	ditto.

Short Diviſion.

Short Diviſion is, when the diviſor does not exceed 12 ; and is performed in the uſual way, only the ſeveral ſteps purſued by the aſſiſtance of figures in *other caſes* are omitted in *this*, and the work wrought entirely by the mind.

Rule. Separate the diviſor from the dividend in the uſual way ; then draw a line under the dividend, and inquire how many times the diviſor is contained in one, or more figures of the dividend, which being found, place the firſt quotient figure directly under the unit figure of that portion of the dividend which you divide ; then, mentally, multiply the diviſor by the quotient figure, and ſubtract the product from the divided number ; to the remainder bring the next figure of the dividend, and inquire how many times the diviſor is contained in that number ; when found, proceed as before. Thus continue, till every figure of the dividend is divided.

Note. If there be a remainder after all the figures of the dividend are divided, ſtrike a ſhort line at the right hand of the quotient, at the end of which place the remainder.

Examples.

1	2	3
2)85763	3)85765	3)13656912
Quot. 42881—1 Rem.	28588—1	4552304

4	5	6	7
5)73855	4)183796	6)138547	7)346756

8	9	10	11
8)49725	9)65548	11)35728	12)58536

Practical Queſtions.

1ſt. Divide ſix thouſand, ſeven hundred and ſixty-four, by nineteen. 356 Anſwer.

2d. Divide ſix thouſand, ſeven hundred and ſixty-four, by three hundred and fifty-ſix. 19 Anſwer.

3d. If five hundred and fifty-five dollars be divided equally among fifteen men, what will each have? 37 dol. Anſwer.

4th. What is the third part of 3669? 1223 Anſwer.

5th. What is the fourth part of 87856? 21964 Anſwer.

6th. What is the twenty-fourth part of 2588? 112 Anſ.

7th. What is the half of 98570? 49285 Anſwer.

8th. What is the hundred and fiftieth part of 2550? 17 Anſ.

9th. A gentleman bought 387 acres of land, for which he gave 8514 dollars. What did it coſt per acre? 22 dol. Anſ.

10th. A gentleman dying, left 16536 dollars, to be divided in the following manner, viz.—To his widow he gave one third part; and the remainder was to be divided equally among four children; what did each have?

5512 dol. widow's portion. } Anſwer.
2756 dol. each child's portion. }

Reduction by Multiplication.

Reduction by Multiplication* teacheth to bring a high denomination to an equivalent value in a low denomination.

RULE. Multiply each deſcending denomination by as many of the next *lower* denomination as make *one* in *that* which you are about to reduce;—thus proceed till the queſtion is brought into the denomination required.

PROOF. Divide the laſt product by the laſt multiplier, and that quotient by the next, &c. If the laſt quotient be equal to the firſt multiplicand, the work is right.

---

* This is called reduction deſcending.

EXAMPLES.

£.
In 434, how many farthings ?
20
8680 ſhillings.
12
104160 pence.
4
416640 farthings.—Anſwer.

Proof. 4)416640	12)104160	20)8680(434	
4	96	80	By ſhort diviſion.
16	81	68	4)416640 farthings.
16	72	60	
			12)104160 pence.
6	96	80	
4	96	80	2|0) 868|0 ſhillings.
24	0		434 pounds.
24			
0			

Note. When there are ſeveral denominations in the queſtion, as, for inſtance, pounds, ſhillings, &c. bring in the odd ſhillings when multiplying by 20, the odd pence when multiplying by 12, &c. Proceed in like manner with all queſtions of this nature.

£. s. d.
In 85 12 8 how many farthings ?
20
Shillings. 1712
12
Pence. 20552
4
Farthings. 82208 Anſwer.

Proof. 4)82208
12)20552
2|0) 171|2—8
£. 85 12 8

N. B. When there is a remainder after dividing, it is always of the ſame denomination with the dividend.

Queſtions.		£.	s.	d.		Anſwers.
1	Reduce	8598	0	0	to farthings.	8254080.
2	———	340	9	8	to pence.	81716.
3	———	103	15	7	to farthings.	99628.
4	———	529	18	9½	to farthings.	508742.
5	———	17	13	4¾	to farthings.	16963.

Troy Weight.

Queſtions.		lb.	oz.	pwt.	gr.		Anſwers.
1	Reduce	347	0	0	0	to grains.	1998720.
2	———	210	8	12	0	to penny-wts.	50572.
3	———	117	9	15	18	to grains.	678618.
4	———	18	5	9	21	to grains.	106317.

Avoirdupois Weight.

		T.	cwt.	qr.	lb.	oz.	dr.		
1	Reduce	3	0	0	0	0	0	to drams.	1720320.
2	———	0	12	1	18	0	0	to ounces.	22240.
3	———	1	15	2	7	0	0	to pounds.	3983.

Apothecaries' Weight.

		℔	℥	ʒ	℈	gr.		
1	Reduce	118	0	0	0	0	to grains.	679680.
2	———	15	7	3	0	0	to drams.	1499.
3	———	11	5	4	1	17	to grains.	66037.
4	———	8	9	5	0	0	to ſcruples.	2535.

Cloth Meaſure.

		yds.	qr.	na.		
1	Reduce	345	0	0	to nails.	5520.
2	———	83	3	0	to quarters.	335.
3	———	14	1	3	to nails.	231.

Long Meaſure.

		mile.	fur.	rod.	yd.	ft.	in.	bar.		
1	Reduce	378	0	0	0	0	0	0	to barley-corns.*	71850240.
2	———	27	5	18	3	1	8	1	to barley-corns.†	5262037.
3	———	38	3	9	0	0	0	0	to inches.	2433222.
4	———	16	0	0	0	0	0	0	to yards.	28160.

Square Meaſure.

		A.	rod.	yd.	ft.	in.		
1	Reduce	130	0	0	0	0	to inches.‡	815443200.
2	———	37	40	0	0	0	to yards.	180290.

---

* 1760 yards make one mile; therefore, when the queſtion is miles only, multiply the miles by 1760; the product will be yards.

† In reducing rods to yards, in long meaſure, multiply the rods by 5; then add half the multiplicand to the product, which ſum will be the multiplicand, multiplied by $5\frac{1}{2}$.

‡ In reducing rods to yards, in ſquare meaſure, multiply the rods by 30; then add one quarter of the multiplicand to the product.

Cubic Meaſure.

Queſtions.		Anſwers.
1	Reduce 40 yards to inches.	1866240.
2	——— 3 tons of round timber to inches.	207360.
3	——— 2 tons of hewn timber to inches.	172800.
4	——— 5 cords of wood to inches.	1105920.

Wine Meaſure.

		hhd.	gal.	qts.	pts.	gill.		
1	Reduce	24	0	0	0	0	to gills.	48384.
2	———	15	19	3	1	2	to gills.	30878.
3	———	9	25	1	0	0	to pints.	4738.

Beer Meaſure.

		hhd.	gal.	qts.	pts.		
1	Reduce	35	0	0	0	to pints.	15120.
2	———	12	15	2	1	to pints.	5309.
3	———	10	17	0	0	to gills.	17824.

Time.

1	In 45 years, how many ſeconds.	1419120000.

Note. I call 365 days a year, although it falls ſhort a little, yet it is exact enough for common purpoſes.

2. In 16 years, 5 months, how many minutes?

yr. mo.
16 5
13
53
16
Months. 213
4
Weeks. 852
7
Days. 5964
24
23856
11928
Hours. 143136
60
Minutes. 8588160 Anſwer.

3. Reduce 1796 years to ſeconds.

1796 yrs.
365
8980
10776
5388
Days. 655540
24
2622160
1311080
Hours. 15732960
60
Minutes. 943977600
60
Seconds. 56638656000 Anſ.

Federal Money.

CASE I. To reduce dollars to cents.

RULE. Place two cyphers at the right hand of the dollars, and the work is done.

EXAMPLES.

1 In 389 dollars, how many cents? 38900 Anſwer.
2 Reduce 4857 dollars to cents. 485700 ——

CASE II. To reduce dollars to mills.

RULE. Annex three cyphers to the dollars.

EXAMPLES.

1 Reduce 389 dollars to mills. 389000 Anſwer.
2 ——— 857 dollars to mills. 857000 ——

CASE III. To reduce dollars and cents to cents.

RULE. Remove the comma from between the dollars and cents, and the work is done.

EXAMPLES.

1 Reduce dol. 385, 50 to cents. 38550 Anſwer.
2 ——— — 593, 08 to cents. 59308 ——

CASE IV. To reduce dollars and cents to mills.

RULE. Remove the comma as in Caſe 3d, and annex one cypher to the right hand.

EXAMPLES.

1 Reduce dol. 35, 75 to mills. 35750 Anſwer.
2 ——— — 85, 03 to mills. 85030 ——
3 ——— — 70, 25 to mills. 70250 ——

CASE V. To reduce cents to mills.

RULE. Annex one cypher to the cents.

Reduce 66 cents to mills. 660 Anſwer.

CASE VI. To reduce dollars, cents and mills to mills.

RULE. Remove the commas from between the dollars and cents, and cents and mills, and the whole ſum is mills.

EXAMPLES.

1 Reduce dol. 38, 75, 7 to mills. 38757 Anſwer.
2 ——— — 49, 03, 5 to mills. 49035 ——
3 ——— — 77, 66, 3 to mills. 77663 ——

Note 1ſt. When you would bring cents into dollars, point off the two right hand figures for cents; the left hand figures are dollars.

EXAMPLES.

1. In 38575 cents, how many dollars? dol. 385, 75 Anſ.
2. In 38705 cents, how many dollars? — 387, 05 —

Note 2d. To bring mills into dollars, cents, &c. point off the firſt right hand figure for mills, the two next for cents; the left hand figures are dollars.

EXAMPLES.

1. In 85697 mills, how many dollars, cents, &c.
   dol. 85, 69, 7 Anſwer.
2. In 387543 mills, how many dollars, cents, &c.
   dol. 387, 54, 3 Anſwer.
3. In 586085 mills, how many dollars, cents, &c.
   dol. 586, 08, 5 Anſwer.

Reduction by Diviſion.

Reduction by Diviſion* teacheth to bring a low denomination to its equivalent value in higher denominations; and is the reverſe of Reduction by Multiplication, and is proved by it.

RULE. Divide the *loweſt* denomination given, by ſo many of *that loweſt* as make *one* in the next higher denomination; thus proceed with every aſcending denomination, till you have brought the queſtion into the denomination required.

EXAMPLES.

1. In 416640 farthings, how many pounds?

```
         12       20   £.
4)416640(104160(8680(434 Anſwer.
  4         96     80
 ——        ——     ——
  16        81     68
  16        72     60
  ——       ——     ——
    6       96     80
    4       96     80
   ——      ——     ——
    24        0
    24
    ——
      0
```

By ſhort diviſion.

```
 4)416640 farthings.
   ——————
12)104160 pence.
   ——————
 2|0) 868|0 ſhillings.
      ——————
      434 pounds.—Anſ.
```

---

* This is called reduction aſcending.

2. In 16963 farthings, how many pounds, ſhillings, &c. ?

```
          12       20    £.  s.  d.
4)16963(4240  (353(17   13  4¾  Anſwer.
  16       36       20
 ----     ----     ----
    9       64      153
    8       60      140
   --     ----     ----
   16       40       13
   16       36
  ----      --
      3      4
```

```
Or thus :   4)16963
              -----
           12) 4240—3
              -----
          2|0) 35|3—4
              -----
            £. 17 13 4¾
```

3. In 99628 farthings, how many pounds, ſhillings, &c. ?
£.103 15 7 Anſwer.

4. In 508742 farthings, how many pounds, ſhillings, &c. ?
£.529 18 $9\frac{1}{2}$ Anſwer.

Note. The foregoing and following queſtions are a proof to thoſe in reduction by multiplication.

5. In 1998720 grains, how many pounds Troy ?
347℔ Anſwer.

6. In 678618 grains, how many pounds, ounces, &c. Troy ?
117℔ 9 oz. 15 pwt. 18 gr. Anſwer.

7. In 1720320 drams, how many tons ? 3 tons Anſwer.

8. In 22240 ounces, how many cwt. quarters, &c. ?
12 cwt. 1 qr. 18℔ Anſwer.

9. In 679680 grains, how many pounds Apothecaries' wt. ?
118℔ Anſwer.

10. In 2535 ſcruples, how many pounds, ounces, &c. ?
8℔ 9℥ 5ʒ Anſwer.

11. In 5520 nails, how many yards ? 345 yds. Anſ.

12. In 231 nails, how many yards, quarters, &c. ?
14 yds. 1 qr. 3 na. Anſ.

13. In 71850240 barley-corns, how many miles ? 378 Anſ.

Note. In the laſt queſtion, I bring barley-corns to yards, and then divide by 1760, the number of yards in a mile.

14. In 28160 yards, how many miles ? 16 Anſ.

15. In 815443200 ſquare inches, how many acres ? 130 Anſ.

Note. In the laſt queſtion, I bring inches to yards, and then divide by 4840, the number of yards in an acre.

16. In 207360 cubic inches, how many tons of round timber? 3 tons Anſ.

17. In 172800 cubic inches, how many tons of hewn timber? 2 tons Anſwer.

18. In 1105920 cubic inches, how many cords of wood? 5 cords Anſwer.

19. In 48384 gills, how many hogſheads wine? 24 Anſ.

20. In 4738 pints, how many hogſheads, gallons, &c. wine? 9hhd. 25gal. 1qt. Anſ.

21. In 15120 pints, how many hogſheads beer? 35 Anſ.

22. In 17824 gills, how many hogſheads, gallons, &c. beer? 10hhd. 17gal. Anſwer.

23. In 1419120000 ſeconds, how many years?* 45 Anſ.

24. In 56638656000 ſeconds, how many years?* 1796 Anſ.

25. In 8588160 minutes, how many lunar years? 16yr. 5mo. Anſwer.

26. In 87950 cents, how many dollars and cents? dol. 879, 50 Anſwer.

27. In 53987 mills, how many dollars, cents, &c.? dol. 53, 98, 7 Anſwer.

Multiplication of Federal Money.

Case I. When the price is *dollars* only, multiply the whole quantity by the price of one yard, pound, &c. the product will be the price of the whole quantity, in dollars.

Examples.

1. To what will 385 acres of land amount, at 25 dollars per acre?

385
25
———
1925
770
———
9625 dol. Anſwer.

2. To what will 45 barrels of flour amount, at 14 dollars per barrel?

45
14
———
180
45
———
630 dol. Anſwer.

** In theſe queſtions I bring ſeconds to days, and then divide by 365.

3. What will 18½ yds. come to, at 4 dollars per yard?

18½
4
72 dol. price of 18 yds.
2 dol. price of ½ yd.
74 dol. price of 18½ yds.

4. What will 25¼ yds. come to, at 8 dollars per yard?

25¼
8
200 dol. price of 25 yds.
2 dol. price of ¼ yd.
202 dol. price of 25¼ yds.

QUESTIONS.					ANSWERS.
	yards, pounds, &c.		dol.		dol.
5.	398	at	12	per yd.	4776.
6.	130	at	10		1300.
7.	95	at	9		855.
8.	47	at	7		329.
9.	74	at	8		592.
10.	29½	at	6		177.

CASE II. When the price is cents only, multiply the whole quantity by the price of one yard, pound, &c. then cut off the two right hand figures of the product for cents, the left hand figures are dollars.

EXAMPLES.

1. What will 125 yards come to, at 75 cents per yd.?

125
75
625
875
dol. 93,75 Anſwer.

2. To what will 216 yards amount, at 25 cents per yard?

216
25
1080
432
dol. 54.00 Anſwer.

QUESTIONS.					ANSWERS.
	yards, pounds, &c.		cents.		dol. cts.
3.	389	at	66	per yd.	256, 74.
4.	132	at	50		66, 00.
5.	830	at	25		207, 50.
6.	100	at	49		49, 00.

QUESTIONS.	yds. pounds, &c.		cts.	ANSWERS. dol. cts.
7.	395	at	56	221, 20.
8.	84	at	16	13, 44.
9.	15	at	87	13, 05.
10.	7	at	50	3, 50.
11.	5	at	99	4, 95.
12.	9	at	75	6, 75.

CASE III. When the price is mills only, multiply the whole quantity by the price of one yard, pound, &c. then point off the firſt right hand figure of the product for mills, the two next for cents; the left hand figures are dollars.

EXAMPLES.

1. To what will 385 pounds of chalk amount, at 9 mills per pound?

```
        385
          9
     ------
dol. 3, 46, 5 Anſwer.
```

2. To what will 475 yards amount, at 8 mills per yard?

```
        475
          8
     ------
dol. 3, 80, 0 Anſwer.
```

3. Suppoſe a man worth 8756 dol. and his tax 3 mills on the dollar; what will his whole tax amount to?

```
        8756
           3
      ------
dol. 26, 26, 8 Anſwer.
```

4. To what will 5867 yards amount, at 5 mills per yard?

```
        5867
           5
      ------
dol. 29, 33, 5 Anſwer.
```

QUESTIONS.	yds. pounds, &c.		mills.	ANSWERS. dol. cts. m.
5.	389	at	7 per yd.	2, 72, 3.
6.	154	at	6	92, 4.
7.	755	at	8	6, 04, 0.
8.	446	at	3	1, 33, 8.
9.	570	at	5	2, 85, 0.
10.	84	at	4	33, 6.
11.	98	at	9	88, 2.

CASE IV. When the price is dollars and cents, place the unit figure of the quantity under the unit figure of the cents, &c. and proceed as in ſimple multiplication; point off the two right hand figures of the product for cents; the left hand figures are dollars.

Note. When the cents are expreſſed by units only, the ten's place muſt be ſupplied with a cypher.

EXAMPLES.

1. What will 253 yds come to, at 5 dollars, 12 cents per yard?

dol. ct.
5, 12
253
1536
2560
1024
dol. 1295, 36 Anſwer.

2. What will 498 yds. come to, at 3 dollars, 5 cents per yard?

dol. ct.
3, 05
498
2440
2745
1220
dol. 1518, 90 Anſwer.

QUESTIONS.	yds. pounds, &c.		dol. ct.		ANSWERS. dol. ct.
3.	598	at	4, 25	per yd.	2541, 50.
4.	150	at	3, 16		474, 00.
5.	980	at	7, 09		6948, 20.
6.	14½	at	10, 50		152, 25.
7.	45	at	1, 06		47, 70.
8.	712	at	18, 75		13350, 00.
9.	94	at	2, 08		195, 52.
10.	25½	at	2, 66		67, 83.
11.	84¼	at	1, 20		101, 10.
12.	26¾	at	2, 40		64, 20.
13.	12½	at	1, 25		15, 62½.

CASE V. When the price is cents and mills, or dollars, cents and mills, place the unit figure of the quantity under the mills, &c. and proceed as in ſimple multiplication; point off the firſt right hand figure of the product for mills, the two next for cents; what then remains on the left hand are dollars.

Note. When cents are expreſſed by units only, the place of tens muſt be ſupplied with a cypher.

EXAMPLES.

1. What will 324 yards come to, at 3 dollars, 25 cents, 6 mills per yard?

dol. ct. m.

3, 25, 6

324

13024

6512

9768

dol. 1054, 94, 4 Anſwer.

2. What will 453 yards come to, at 84 cents, 7 mills per yard?

ct. m.

84, 7

453

2541

4235

3388

dol. 383, 69, 1 Anſwer.

QUESTIONS. ANSWERS:

	yds. pounds, &c.		dol.	ct.	m.		dol.	ct.	m.
3.	785	at	4,	50,	7	per yard.	3537,	99,	5.
4.	356	at	25,	08,	6		8930,	61,	6.
5.	95	at	13,	19,	9		1253,	90,	5.
6.	94	at	6,	18,	5		581,	39,	0.
7.	78	at	9,	33,	8		728,	36,	4.
8.	45	at		75,	5		33,	97,	5.
9.	183	at		20,	7.		37,	88,	1.
10.	15	at	7,	25,	3		108,	79,	5.

11. To what will 859 pair of ſhoes amount, at one dollar, eight cents, five mills per pair? dol. 932, 01, 5 Anſwer.

Compound Multiplication.

Compound Multiplication is, when the multiplicand conſiſts of ſeveral denominations, and is an excellent rule in finding the amount of goods, when the price is in lawful money.

RULE. Place the multiplier under the loweſt denomination, and carry for the ſame, as in addition of lawful money.

CASE I. When the quantity does not exceed 12, multiply the price of one yard, pound, &c. by the whole quantity; the product will be the anſwer.

EXAMPLES.

1. What will 3 yards come to, at 1 pound, 6 ſhillings and 8 pence per yard?

£. s. d.

1 6 8

3

£.4 0 0 Anſwer.

2. What will 5 yards come to, at 1 pound, 10 ſhillings and 3 pence half penny per yard?

£. s. d.

1 10 3½

5

£.7 11 5½ Anſwer.

In the ſecond example, I ſay, five half pence are two pence half penny; I ſet down the half penny, and carry two; then, five times three are fifteen, and two I carry are ſeventeen pence; I ſet down five, and carry one; then, five times ten are fifty, and one I carry are fifty-one ſhillings; I ſet down eleven, and carry two; then, five times one are five, and two I carry are ſeven pounds.

QUESTIONS. ANSWERS.

	yds. pounds, &c.		£.	s.	d.		£.	s.	d.
3.	4	at	1	8	6 per yard.		5	14	0.
4.	2	at	1	13	4		3	6	8.
5.	6	at	2	3	4½		13	0	3.
6.	7	at	1	14	7¼		12	2	2¾.
7.	8	at	0	15	3		6	2	0.
8.	9	at	0	13	4		6	0	0.
9.	10	at	1	6	8		13	6	8.
10.	11	at	0	9	3½		5	2	2½.
11.	12	at	0	7	6¼		4	10	3.
12.	5	at	1	2	4¼		5	11	9¼.

CASE II. When the quantity is any number in the multiplication table, over twelve, multiply the price of one yard, pound, &c. by thoſe two numbers, which when multiplied together, will produce the given quantity.

EXAMPLES.

1. What will 15 yards come to, at 1 pound, 3 ſhillings, and 4 pence half penny per yard?

£. s. d.
1 3 4½
5
5 16 10½ price of 5 yds.
3
£.17 10 7½ price of 15 yds.

2. What will 24 yards come to, at 8 ſhillings and 6 pence three farthings per yard?

£. s. d.
0 8 6¾
6
2 11 4½ price of 6 yds.
4
£.10 5 6 price of 24 yds.

QUESTIONS. ANSWERS

	yds. pounds, &c.		£.	s.	d.		£.	s.	d.
3.	18	at	1	7	2½	per yd.	24	9	9.
4.	33	at	1	13	4		55	0	0.
5.	36	at	0	13	4		24	0	0.
6.	15	at	1	3	4¼		17	10	3¾.
7.	14	at	0	6	8½		4	13	11.
8.	42	at	0	3	4		7	0	0.
9.	54	at	1	2	6		60	15	0.
10.	66	at	0	6	8		22	0	0.
11.	72	at	0	19	10		71	8	0.
12.	84	at	0	5	1½		21	10	6.
13.	99	at	1	13	4		165	0	0.
14.	49	at	0	17	6¾		43	0	6¾.
15.	100	at	0	15	7¼		78	0	5.
16.	110	at	0	2	3¼		12	9	9½.
17.	120	at	1	4	5		146	10	0.
18.	132	at	0	3	2		20	18	0.
19.	121	at	1	2	3½		134	17	3½.
20.	144	at	0	16	6½		119	2	0.

CASE III. When the quantity is ſuch, that no two numbers multiplied together will produce it exactly, or when there are parts of a yard, pound, &c. in the queſtion, multiply as in Caſe 2, by two ſuch numbers as come neareſt to the given quantity ; then add or ſubtract the price of the odd yards, or parts of a yard, pound, &c. as the caſe may require.

EXAMPLES.

1. What will 17 yds. come to, at 1 pound, 3 ſhillings and 4 pence per yard ?

	£.	s.	d.	
	1	3	4	
			4	
	4	13	4	price of 4 yds.
			4	
	18	13	4	price of 16 yds.
add	1	3	4	price of 1 yd.
	£.19	16	8	price of 17 yds.

2. What will 19½ yds. come to, at 8 ſhillings and 6 pence half penny per yard ?

	£.	s.	d.	
	0	8	6½	
			10	
	4	5	5	price of 10 yds.
			2	
	8	10	10	price of 20 yds.
ſubtr.		4	3¼	price of ½ yard.
	£.8	6	6¾	price of 19½ yds.

QUESTIONS.							ANSWERS.		
	yds. pounds, &c.		£.	s.	d.		£.	s.	d.
3.	26	at	0	7	5	per yd.	9	12	10.
4.	30½	at	0	8	6		12	19	3.
5.	27½	at	0	18	7		25	11	0½.
6.	43	at	1	6	8½		57	8	5½.
7.	57	at	0	19	3		54	17	3.
8.	19	at	1	3	6		22	6	6.
9.	60¼	at	1	4	6		73	16	1½.
10.	67	at	0	13	4		44	13	4.
11.	77½	at	0	18	10		72	19	7.
12.	81¼	at	1	8	6		116	9	10¼.
13.	145	at	0	2	6		18	2	6.
14.	119	at	0	3	2¾		19	4	3¼.
15.	112	at	1	1	4		119	9	4.
16.	143¼	at	0	0	9		5	7	5¼.
17.	99½	at	1	3	4½		116	5	9¾.

CASE IV. When the quantity is any number of hundreds under thirteen, find the price of one hundred by Caſe 2d, then multiply the price of one hundred by ſo many as there are hundreds in the queſtion.

EXAMPLES.

1. What will 300 yds. come to, at 1 pound, 3 ſhillings, and 4 pence per yard?

£.	s.	d.	
1	3	4	
		10	
11	13	4	price of 10 yds.
		10	
116	13	4	pr. of 100 yds.
		3	
£.350	0	0	pr. of 300 yds.

2. What will 400 yds. come to, at 6 ſhillings and 3 pence half penny per yard?

£.	s.	d.	
0	6	3½	
		10	
3	2	11	price of 10 yds.
		10	
31	9	2	pr. of 100 yds.
		4	
£.125	16	8	pr. of 400 yds.

QUESTIONS.							ANSWERS.		
	yds. pounds, &c.		£.	s.	d.		£.	s.	d.
3.	500	at	0	8	0	per yd.	200	0	0.
4.	600	at	1	2	7½		678	15	0.
5.	700	at	0	11	7		405	8	4.
6.	800	at	1	6	2¼		1047	10	0.

QUESTIONS.	yds. pounds, &c.		£.	s.	d.	ANSWERS. £.	s.	d.
7.	400	at	1	10	0	600	0	0.
8.	900	at	0	13	4½	601	17	6.
9.	1000	at	0	18	4¾	919	15	10.
10.	1100	at	0	3	8	201	13	4.
11.	1200	at	0	3	4	200	0	0.
12.	300	at	1	2	1½	331	17	6.
13.	200	at	0	0	2¼	1	17	6.
14.	400	at	0	1	3¾	26	5	0.
15.	700	at	0	2	3	78	15	0.
16.	900	at	0	1	2¼	53	8	9.

CASE V. When the quantity is any number of thouſands under thirteen, find the price of one thouſand by Caſe 4th, then multiply the price of one thouſand by ſo many as there are thouſands in the queſtion.

EXAMPLES.

1. What will 3000 yds. come to, at 1 pound, 2 ſhillings and 3 pence per yard?

£.	s.	d.	
1	2	3	
		10	
11	2	6	price of 10 yds.
		10	
111	5	0	pr. of 100 yds.
		10	
1112	10	0	pr. of 1000 yds.
		3	
£.3337	10	0	pr. of 3000 yds.

2. What will 4000 yards come to, at 3 ſhillings and 3 pence 1 farthing per yard?

£.	s.	d.	
0	3	3¼	
		10	
1	12	8½	price of 10 yds.
		10	
16	7	1	pr. of 100 yds.
		10	
163	10	10	pr. of 1000 yds.
		4	
£.654	3	4	pr. of 4000 yds.

QUESTIONS.	yds. pounds, &c.		£.	s.	d.	ANSWERS. £.	s.	d.
3.	5000	at	0	17	4 per yard.	4333	6	8.
4.	6000	at	1	6	8	8000	0	0.
5.	9000	at	0	13	4	6000	0	0.
6.	7000	at	0	1	6½	539	11	8.

QUESTIONS. yds. pounds, &c.			£.	s.	d.	ANSWERS. £.	s.	d.
7.	2000	at	0	19	3¼	1927	1	8.
8.	10000	at	0	17	8	8833	6	8.
9.	11000	at	0	2	3¾	1271	17	6.
10.	12000	at	0	2	6½	1525	0	0.
11.	9000	at	1	6	8	12000	0	0.
12.	4000	at	0	2	6	500	0	0.
13.	3000	at	1	10	0	4500	0	0.

CASE VI. When the quantity is any number of hundreds, or thouſands over twelve, which are expreſſed by numbers in the multiplication table, find the price of one hundred, or thouſand, by the foregoing Caſes; then multiply the price of one hundred, or thouſand, by two ſuch numbers as, when multiplied together, will expreſs the hundreds, or thouſands, in the queſtion.

EXAMPLES.

1. What will 1800 yards come to, at 3 ſhillings and 2 pence per yard?

£.	s.	d.	
0	3	2	
		10	
1	11	8	price of 10 yds.
		10	
15	16	8	price of 100 yds.
		6	
95	0	0	price of 600 yds.
		3	
£.285	0	0	price of 1800 yds.

2. What will 24000 yards come to, at 4 ſhillings and 5 pence 1 farthing per yard?

£.	s.	d.	
0	4	5¼	
		10	
2	4	4½	price of 10 yds.
		10	
22	3	9	price of 100 yds.
		10	
221	17	6	price of 1000 yds.
		6	
1331	5	0	price of 6000 yds.
		4	
£.5325	0	0	pr. of 24000 yds.

QUESTIONS. yds. pounds, &c.			£.	s.	d.	ANSWERS. £.	s.	d.
3.	36000	at	0	15	7 per yd.	28050	0	0.
4.	4200	at	0	16	8	3500	0	0.
5.	33000	at	0	15	7½	25781	5	0.
6.	2400	at	0	2	6	300	0	0.
7.	56000	at	0	11	10	33133	6	8.

QUESTIONS.	yds. pounds, &c.		£.	s.	d.	ANSWERS. £.	s.	d.
8.	3600	at	0	1	8	300	0	0.
9.	49000	at	0	12	5	30420	16	8.
10.	2800	at	0	8	9	1225	0	0.
11.	7200	at	0	3	4	1200	0	0.

CASE VII. When the quantity is hundreds, or thouſands, which are not expreſſed by numbers in the multiplication table, find the price of the whole quantity as near as you can by Caſe VI. then add or ſubtract the price of the odd hundreds, or thouſands, as the caſe may require.

EXAMPLES.

1. What will 1900 yards come to, at 2 ſhillings and 6 pence per yard?

	£.	s.	d.	
	0	2	6	
			10	
	1	5	0	pr. of 10 yds.
			10	
	12	10	0	pr. of 100 yds.
			6	
	75	0	0	pr. of 600 yds.
			3	
	225	0	0	pr. of 1800 yds.
add	12	10	0	pr. of 100 yds.
	£.237	10	0	pr. of 1900 yds.

2. What will 23000 yards come to, at 1 ſhilling and 4 pence 3 farthings per yard?

	£.	s.	d.	
	0	1	4¾	
			10	
	0	13	11½	pr. of 10 yds.
			10	
	6	19	7	pr. of 100 yds.
			10	
	69	15	10	pr. of 1000 yds.
			6	
	418	15	0	pr. of 6000 yds.
			4	
	1675	0	0	pr. of 24000 yds.
ſubtr.	69	15	10	pr. of 1000 yds.
	£.1605	4	2	pr. of 23000 yds.

QUESTIONS.	yds. pounds, &c.		£.	s.	d.	ANSWERS. £.	s.	d.
3.	85000	at	0	12	3 per yd.	52062	10	0.
4.	1700	at	0	6	8	566	13	4.
5.	59000	at	0	2	6	7375	0	0.
6.	2600	at	0	13	4	1733	6	8.
7.	37000	at	0	8	3½	15339	11	8.
8.	4600	at	0	12	4	2836	13	4.
9.	145000	at	0	4	6	32625	0	0.
10.	98000	at	0	2	4½	11637	10	0.

CASE VII. When the quantity conſiſts of units, tens, hundreds, thouſands, &c. find the price of the thouſands, hundreds, &c. ſeparately; then add the price of the ſeveral parts together; the ſum will be the price of the whole quantity.

EXAMPLES.

1. To what will 48448 yards amount, at 2 ſhillings and 6 pence per yard?

£.	s.	d.	
0	2	6	price of 1 yd.
		10	
1	5	0	pr. of 10 yds.
		10	
12	10	0	pr. of 100 yds.
		10	
125	0	0	pr. of 1000 yds.
		8	
1000	0	0	pr. of 8000 yds.
		6	
6000	0	0	pr. of 48000 yds.
50	0	0	pr. of 400 yds.
6	0	0	pr. of 48 yds.
£.6056	0	0	price of 48448 yards.—Anſwer.

£.	s.	d.	
12	10	0	pr. of 100 yds.
		4	
£.50	0	0	pr. of 400 yds.
0	2	6	pr. of 1 yd.
		8	
1	0	0	pr. of 8 yds.
		6	
£.6	0	0	pr. of 48 yds.

QUESTIONS.						ANSWERS.		
	yds. pounds, &c.		£.	s.	d.	£.	s.	d.
2.	96369	at	0	13	4 per yd.	64246	0	0.
3.	32840	at	0	2	6	4105	0	0.
4.	9382	at	0	6	8	3127	6	8.
5.	6432	at	0	1	3	402	0	0.
6.	153½	at	1	3	4½	179	8	0¾.
7.	1277¾	at	0	4	6	287	9	10½.

Case IX. To find the price of an *hundred (groſs)* or 112 pounds, having the price of one pound given.

Rule. Multiply the price of one pound by 7, its product by 4, and this product again by 4; the laſt product will be the anſwer.

Examples.

1. What will 1 cwt. of lead come to, at 6½d. per pound?

£.	s.	d.	
0	0	6½	price of 1 ℔.
		7	
0	8	9½	price of 7 ℔.
		4	
0	15	2	price of 28 ℔. or ¼ cwt.
		4	
£.3	0	8	price of 1 cwt.

2.	1 cwt. of ſugar, at 10d. per pound?	£.4 13 4 Anſ.
3.	1 cwt. of tobacco, at 1/2 per pound?	£.6 10 8 ——

Case X. Having the price of one pound given, to find the price of two or more cwts.

Rule. Find the price of 1 cwt. by Caſe IX. then multiply the price of 1 cwt. by ſo many as there are cwts. in the queſtion.

Note. If the quantity exceed twelve cwt. having found the price of 1 cwt. proceed as in Caſe II. or III.

Questions.	Answers.
1. 5 cwt. of cheeſe, at 6½d. per pound?	£.15 3 4.
2. 8 cwt. of tobacco, at 10d. per pound?	£.37 6 8.
3. 25 cwt. of cotton, at 1/2 per pound?	£.163 6 8.

Compound Diviſion.

Compound Diviſion is, when the dividend conſiſts of ſeveral denominations.

Rule. Separate the diviſor from the dividend as in ſimple diviſion; then proceed to divide, beginning with the higheſt denomination, and having divided *that*, if there be a remainder, reduce it to the next lower denomination, and add in that which is of the ſame name; then divide as before. Thus continue to reduce and divide till every denomination is divided.

Case I. When the ſhares are equal, divide by the number of partners; the quotient will be each one's particular ſhare.*

Examples.

1. If £.24 9 9 be divided equally among 18 men, what will each have?

£. s. d. £. s. d.
18)24 9 9 (1 7·2½ Anſwer.
18
—
6
20
——
18)129(7
126
——
3
12
——
18)45(2
36
—
9
4
—
18)36(2
36
——

In this example, I find that the diviſor is contained but once in the higheſt denomination, which is pounds; I then ſubtract the diviſor 18 from 24 pounds, and find that 6 remains, which I multiply by 20, and add in the 9 ſhillings; I thus proceed till every denomination is divided.

2. If £.17 10 3¾ be divided equally among 15 perſons, what will each have? £.1 3 4¼ Anſwer.

---

* All the queſtions in the firſt and ſecond caſes of compound diviſion may be proved by compound multiplication.

3. If £.165 be divided equally among 99 perſons, what will each have? £.1 13 4 Anſwer.

4. If £.9 12 10 be divided equally among 26 perſons, what will each have? 7/5 Anſwer.

5. Twenty-four perſons have a frolic; and after they have broke up, they find their reckoning amounts to £.10 5 6; what muſt each pay? 8/6¾ Anſwer.

Note. When the diviſor does not exceed 12, proceed as directed in ſhort diviſion; only with this difference, that when there is a remainder, after dividing *one* denomination, you muſt reduce it, mentally, to the *next lower* denomination, and add to it that part of the dividend which is of the ſame name; then proceed to divide, and ſet each figure of the quotient directly under thoſe of the ſame denomination.

EXAMPLES.

1. If 4 pounds be divided equally among 3 perſons, what will each have?

£. s. d.
3)4 0 0

£.1 6 8 Anſwer.

2. Divide 7 pounds, 11 ſhillings, and 5 pence half penny equally among 5 perſons.

£. s. d.
5)7 11 5½

£.1 10 3½ Anſwer.

3. Divide 12 pounds, 2 ſhillings, and 2 pence 3 farthings equally among 7 perſons.

£. s. d.
7)12 2 2¾

£.1 14 7¼ Anſwer.

4. Divide 72 pounds, 5 ſhillings equally among 10 perſons.

£. s. d.
10)72 5 0

£. 7 4 6 Anſwer.

5. If £.4 10 3 be divided equally among twelve men, what will each have? 7/6¼ Anſwer.

6. If £.13 0 3 be divided equally among ſix men, what will each have? £.2 3 4½ Anſwer.

7. A gentleman dying, left £.963 18 to be divided in the following manner, viz. To the widow he gave one third part, and the remainder was to be divided equally among 6 children; what was each one's portion?

£.321 6 widow's portion. }
107 2 each child's portion. } Anſwer.

CASE II. Having the price of any number or quantity given, to find the price of *one* yard, pound, &c.

RULE. Divide the price of the whole number or quantity by the number or quantity; the quotient will be the price of one yard, pound, &c.

EXAMPLES.

1. If I give £.678 15 for 600 yards of cloth; what is the price of one yard?

```
        £.   s.  £.  s.  d.
    600)678  15 (1   2   7½ Answer.
        600
        ———
         78
          20
        ———
    600)1575(2
        1200
        ———
         375
          12
        ———
    600)4500(7
        4200
        ———
         300
           4
        ———
    600)1200(2
        1200
        ———
```

2. If 1100 yards coſt £.201 13 4; what is it per yard?
3/8 Anſwer.

3. If 900 yards coſt £.53 8 9; what is it per yard?
1/2¼ Anſwer.

4. If 145 pounds of cotton coſt £.18 2 6; what is the price of 1 pound? 2/6 Anſwer.

Case III. When the ſhares are unequal, divide the ſum by the number of ſimple ſhares; the quotient will be the firſt one's ſhare; then multiply the firſt one's ſhare by ſo many as the ſecond has ſhares more than the firſt; the product will be the ſecond's ſhare. Thus proceed for every ſucceeding ſhare.

Proof. Add all the ſhares into one ſum; if it be equal to the dividend, the work is right.

EXAMPLES.

1. Divide £.112 1 among A, B, and C; give B twice as much as A, and C three times as much as B; what will each have?

A has 1 ſimple ſhare.
B — 2 ſimple ſhares.
C — 6 ſimple ſhares.
9 number of ſimple ſhares.

£.	s.	£.	s.	
9)112	1 (	12	9	A's ſhare.
9			2	
22		£.24	18	B's ſhare.
18			3	
4		£.74	14	C's ſhare.
20				
		£.112	1	Proof.
9)81(9				
81				

2. If you divide £.364 between A and B, and give B twice as much as A, what will each have?

£.121	6	8	A's ſhare.	Anſwer.
242	13	4	B's ſhare.	

3. Divide £.326 16 among A, B, C, and D; give B three times as much as A, C four times as much as B, and D five times as much as C; what will each have?

£.4	6	A's ſhare.	Anſwer.
12	18	B's ſhare.	
51	12	C's ſhare.	
258	0	D's ſhare.	

4. Divide £.3838 3 6 among A, B, C, and D; give B four times as much as A, C three times as much as B, and D ten times as much as all the others; what will each have?

£. 20	10	6	A's ſhare.	Anſwer.
82	2	0	B's ſhare.	
246	6	0	C's ſhare.	
3489	5	0	D's ſhare.	

5. A gentleman dying, left £.666 18, of which his widow was to have one third part, and the remainder was to be divided among ſeven children, in ſuch manner as to give the oldeſt a double portion; what did each have?

£.222	6	0	widow's portion.	Anſwer.
55	11	6	ſingle portion.	
111	3	0	double portion.	

6. Divide £.389 8 6 among A, B, and C; give B ten times as much as A, and C ten times as much as B; what will each have?

£. 3	10	2	A's ſhare.	Anſwer.
35	1	8	B's ſhare.	
350	16	8	C's ſhare.	

7. Divide £.196 15 9 among 3 men, 3 women, and 3 boys; give each man double to each woman, and each woman double to each boy; what will each have?

£. 9	7	5	one boy's ſhare.	Anſwer.
18	14	10	one woman's ſhare.	
37	9	8	one man's ſhare.	

Diviſion of Federal Money.

CASE I. When the dividend is dollars only.

RULE. Proceed as in ſimple diviſion, and if there be a remainder, make a comma at the right hand of the quotient, then annex two cyphers to the remainder, and divide as before, and ſet the quotient at the right hand of the comma, which will be cents; then, if there be ſtill a remainder, make a comma at the right hand of the cents, and annex one cypher to the remainder, and divide as before; the quotient will be mills.*

---

* To prove queſtions in this, and the following caſes, multiply the quotient by the diviſor, and add in the laſt remainder; then point off the figures of the product, as directed in Multiplication of Federal Money.

EXAMPLES.

1.
```
    dol.  dol.  cts.
28)9758(348,  50
   84
   ---
   135
   112
   ---
    238
    224
    ----
     1400
     140
     ----
      0
```

2
```
    dol.  dol.  cts.  m.
18)7568(420,  44,   4
   72
   --
    36
    36
   ----
     800
     72
     --
      80
      72
      --
       80
       72
       --
        8
```

3. If three thouſand, five hundred and eight dollars be divided equally among forty-five men; what will each have?

dol. 77, 95, 5 Anſ.

4. If 630 dollars be divided equally among 14 men, what will each have? 45 dol. Anſwer.

5. If 785 dollars be divided equally among 17 men, what will each have? dol. 46 17 6 Anſwer.

CASE II. When the dividend is dollars and cents.

RULE. Proceed as in ſimple diviſion till every figure of the dividend is brought down; then point off the two right hand figures of the quotient for cents; and if there be a remainder, make a comma at the right hand of the cents, and annex a cypher to the remainder; then divide, and place the quotient figure, which is mills, at the right hand of the comma.

EXAMPLES.

1.
```
    dol.  ct.  dol.  ct.  m.
56)783, 75(13,  99,  5
   56
   ---
   223
   168
   ---
    557
    504
    ----
     535
     504
     ---
      310
      280
      ---
       30
```

2.
```
    dol.  ct.  dol.  ct.  m.
36)425, 25(11,  81,  2
   36
   --
    65
    36
   ---
    292
    288
    ---
     45
     36
     ---
      90
      72
      --
      18
```

Note. When the diviſor is greater than the number of dollars in the dividend, the quotient will be cents only, or cents and mills.

3
dol. ct. ct. m.
25)18, 83 (75, 3
175
―――
133
125
―――
80
75
――
5

4
dol. ct. ct.
15) 10, 50 (70
105
―――
0

5. Divide 542 dollars, 33 cents, equally among 12 men; what will each have? dol. 45, 19, 4 Anſwer.

6. Divide 89 dollars, 5 cents, equally among 9 men; what will each have? dol. 9, 89, 4 Anſwer.

7. Divide 12 dollars, 66 cents, equally among 16 men; what will each have? cents 79, 1 Anſwer.

CASE III. When the dividend is cents and mills, or dollars, cents, and mills.

RULE. Proceed as in ſimple diviſion, till every figure of the dividend is brought down and divided; then point off the firſt right hand figure of the quotient for mills, the two next for cents; what then remains on the left hand are dollars.

EXAMPLES.

1
dol. ct. m. dol. ct. m.
75) 431, 60, 7 (5, 75, 4
375
―――
566
525
―――
410
375
―――
357
300
―――
57

2
dol. ct. m. dol. ct. m.
65) 108, 08, 5 (1, 66, 2
65
――
430
390
―――
408
390
―――
185
130
―――
55

3. If two hundred and ninety-five dollars, twenty cents, five mills be divided equally among thirteen men, what will each have? dols. 22, 70, 8 Anſwer.

4. If one hundred and two dollars, eight cents, ſix mills be divided equally among nine men, what will each have?

dol. 11, 34, 3 Anſwer.

5. If 45 yards of cloth coſt 33 dollars, 97 cents, 5 mills; what is the price of one yard? cents 75, 5 Anſwer.

6. If 183 yards coſt 37 dollars, 88 cents, 1 mill, what is the price of 1 yard? cents 20, 7 Anſwer.

7. If 15 yards coſt 108 dollars, 79 cents, 5 mills; what is the price of one yard? dol. 7, 25, 3 Anſwer.

Practical Queſtions in Federal Money.

1. Divide 408 dollars among A, B, and C; give B three times as much as A, and C four times as much as B; what will each have?

dol. 25, 50 A's ſhare
76, 50 B's ſhare. Anſwer:
306, 00 C's ſhare.

2. A gentleman divided 2586 dollars among two ſons and a daughter, in the following manner, viz. to the firſt ſon he gave one half; to the ſecond, one third; and the reſt to the daughter; what did each have?

dol. 1293 firſt ſon's ſhare.
862 ſecond's ſhare. Anſwer.
431 daughter's ſhare.

3. Suppoſe I give 2775 dollars for 150 acres of land; what do I give per acre? dol. 18, 50 Anſwer.

4. Divide 16329 dollars, 25 cents among A, B, C, and D; give B twelve times as much as A, C ten times as much as B, and D ten times as much as C; what will each have?

dol. 12, 25 A's ſhare.
147, 00 B's ſhare. Anſwer.
1470, 00 C's ſhare.
14700, 00 D's ſhare.

5. Divide 462 dollars in ſuch manner as to give A an eighth part, and B the reſt; what will each have?

dol. 57, 75 A's ſhare. Anſwer.
404, 25 B's ſhare.

APPLICATION *of the foregoing* RULES.

Queſtions.*

1. Write in figures the following number, viz. One hundred and two million, three hundred and four thouſand, five hundred and ſix.

2. A, B, and C bought a quantity of goods; for which A paid 145 dollars, B 508 dollars, and C 1056 dollars; what did the goods coſt? 1709 dol. Anſwer.

3. A gentleman has four farms. The firſt is valued at £.3518 15 8, the ſecond at £.295 13, the third at £.158 14 $7\frac{1}{2}$, the fourth at £.72 3 6; what are they all worth? £.4045 6 $9\frac{1}{2}$ Anſwer.

4. A man bought three horſes; for the firſt he gave 147 dollars, 75 cents; for the ſecond, 97 dollars, 50 cents; and for the third, 80 dollars, 25 cents; what did the horſes coſt him? dol. 325, 50 Anſwer.

5. How many muſt be added to 95 in order to make the ſum 149? 54 Anſwer.

6. How many muſt be taken from 149, in order to have the remainder 54? 95 Anſwer.

7. What is the difference between one hundred and one, and two thouſand and two? 1901 Anſwer.

8. Suppoſe a man born in the year 1713; how old will he be in the year 1797? 84 Anſwer.

9. A challenged B to ſwap horſes. A valued his horſe at 108 dollars, B valued his at 136 dollars, but A being unwilling to pay the difference, they agreed to *ſplit* the difference; how much boot-money did B receive? 14 dol. Anſwer.

10. What is the product of 184 and 75? 13800 Anſwer.

11. Suppoſe a corn-field contain 385 rows, and each row produce fifteen buſhels; how many buſhels will the whole field produce? 5775 buſhels. Anſwer.

12. To what will the corn in the laſt queſtion amount, at 6/8 per buſhel? £.1925 Anſwer.

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* In theſe queſtions the work at large is omitted, with a view to exerciſe the learner.

13. Said Harry to Tom, if you divide the number of my apples by 9, the quotient will be 15; now if you underſtand figures well enough to tell how many apples I have, you ſhall have a third part of them: What number of apples had Harry, and how many did he give Tom?

135 number of Harry's apples.
45 he gave Tom. } Anſwer.

14. How many ½*d.* and farthings are there in £.15 10 7?

7454 half pence.
14908 farthings. } Anſwer.

15. Said A to B, how old are you? 19 years, anſwered B; and how old are you? To which A replied, the ſum of both our ages is 55; now ſaid A, if you will tell my age in two minutes, I will give you as many farthings as I am years old; how old was A, and how much money did he offer B?

36 A's age.
9 pence. } Anſwer.

16. If 1176 dollars be divided among *ſo many*, that each man's ſhare is 14 dollars, how many partners are there? 84 Anſ.

17. Divide 87 dollars, 50 cents, among A, B, C, D, and E; give B one dollar more than A, C one dollar more than B, &c. what will each have?

dols. 15, 50 A's ſhare.
16, 50 B's ſhare.
17, 50 C's ſhare. } Anſwer.
18, 50 D's ſhare.
19, 50 E's ſhare.

18. A gentleman had two ſons and a daughter, to whom he gave the following ſums, viz. To the firſt ſon he gave £.218 16 8; to the ſecond, £.139 17 6; and to the daughter, a ſum, which if added to the ſecond ſon's, would make a ſum equal to the firſt ſon's; what was his daughter's portion?

£.78 19 2 Anſwer.

19. What number is that, which if multiplied by 18, and the product divided by 9, will leave 50 in the quotient? 25 Anſ.

20. What is the difference between ſix and eight pence, and eight and ſix pence? 1/10 Anſwer.

21. The product of A's and B's ages is 1800; A's age is 75 years; what is B's age? 24 years. Anſwer.

VULGAR FRACTIONS.

FRACTIONS are parts of an unit, or whole number; and are expreſſed by two numbers, one being placed over the other, and ſeparated by a line thus, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{5}$, $\frac{9}{10}$, ſignifying one third, one fourth, three fifths, nine tenths, &c.

The number above the line is called the *numerator*;* that under the line is called the *denominator*.

The denominator ſhews the number of parts into which the integer is divided; and the numerator ſhews how many of thoſe parts are taken.

Fractions are of four kinds, viz. *proper*, *improper*, *compound*, and *mixed*.

1. A *proper fraction* is when the numerator is leſs than the denominator; thus, $\frac{2}{3}$ $\frac{7}{8}$ $\frac{1}{5}$ $\frac{9}{12}$ $\frac{11}{19}$, &c.

2. An *improper fraction* is when the denominator is leſs than the numerator; thus, $\frac{4}{2}$ $\frac{8}{3}$ $\frac{12}{5}$ $\frac{18}{4}$, &c.

3. A *compound fraction* is the fraction of a fraction, and is thus expreſſed, $\frac{1}{3}$ of $\frac{3}{4}$; $\frac{1}{8}$ of $\frac{5}{6}$ of $\frac{3}{4}$; and is thus read, one third of three fourths; one eighth of five ſixths of three fourths.

4. A *mixed number* is a whole number with a fraction annexed, thus, $8\frac{3}{4}$, $12\frac{1}{2}$, $9\frac{5}{7}$; that is, eight and three fourths, twelve and an half, &c.

Note. Any whole number may be made an improper fraction, by drawing a line under it, and making 1 the denominator; thus, 8, 11, 18, 24, may be expreſſed $\frac{8}{1}$ $\frac{11}{1}$ $\frac{18}{1}$ $\frac{24}{1}$, which are improper fractions.

A fraction, when it is expreſſed by the leaſt numbers poſſible, is in its loweſt terms; thus $\frac{72}{144}$, $\frac{53}{159}$, when reduced to their loweſt terms, are $\frac{1}{2}$, $\frac{1}{3}$.

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* The *remainder*, after dividing any number, is the *numerator*, and the *diviſor* is the *denominator*: which fraction, when reduced to its loweſt terms, ſhould always be annexed to the quotient.

Reduction of Vulgar Fractions.

Case I. To reduce fractions to their loweſt terms.

Rule. Divide both the numerator and denominator by any number which will divide them without a remainder; the quotient of each again by the ſame or another number, which will do likewiſe; thus continue to divide till no number greater than 1 will divide them without a remainder; the fraction will then be in its loweſt terms.

Examples.

1. Reduce $\frac{108}{144}$ to its loweſt terms.

$$\overset{2}{\frac{108}{144}} \mid \overset{6}{\frac{54}{72}} \mid \overset{3}{\frac{9}{12}} \mid \frac{3}{4} \text{ Anſwer.}$$

In this example, I firſt divide the numerator and denominator by 2; their quotients by 6; theſe quotients again by 3, which brings the fraction to its loweſt terms.

Note. A fraction may be brought to its loweſt terms thus, divide the denominator by the numerator, and if there be a remainder divide the numerator by it; thus continue to divide the laſt diviſor by the laſt remainder till nothing remain; then divide both the numerator and denominator of the given fraction *by this laſt diviſor*; their quotients will ſhew the given fraction in its loweſt terms.

For example, take the firſt.

$$\begin{array}{l} 108)144(1 \\ 108 \\ \hline 36)108(3 \\ 108 \\ \hline \end{array}$$

Then, $36)\frac{108}{144}(\frac{3}{4}$ Anſwer.

2. Reduce $\frac{9}{18}$ to its loweſt terms. $\frac{1}{2}$ Anſwer.
3. Reduce $\frac{20}{60}$ to its loweſt terms. $\frac{1}{3}$ Anſwer.
4. Reduce $\frac{27}{45}$ to its loweſt terms. $\frac{3}{5}$ Anſwer.
5. Reduce $\frac{176}{192}$ to its loweſt terms. $\frac{11}{12}$ Anſwer.

6. Reduce $\frac{25}{200}$ to its loweſt terms. $\frac{1}{8}$ Anſwer.
7. Reduce $\frac{126}{210}$ to its loweſt terms. $\frac{9}{15}$ Anſwer.
8. Reduce $\frac{1296}{3024}$ to its loweſt terms. $\frac{3}{7}$ Anſwer.

Case II. To reduce a mixed number to an improper fraction.

Rule. Multiply the integer by the denominator of the fraction, and to the product add the numerator; then draw a line and place the denominator under it.

EXAMPLES.

1. Reduce $8\frac{3}{5}$ to an improper fraction.

$$\begin{array}{r} 8\frac{3}{5} \\ 5 \\ \hline 43 \end{array}$$

$\frac{43}{5}$ Anſwer.

2. Reduce $15\frac{1}{4}$ to an improper fraction. $\frac{61}{4}$ Anſ.
3. Reduce $12\frac{1}{2}$ to an improper fraction. $\frac{25}{2}$ Anſ.
4. Reduce $25\frac{3}{4}$ to an improper fraction. $\frac{103}{4}$ Anſ.

Case III. To reduce an improper fraction to a whole or mixed number.

Rule. Divide the numerator by the denominator; the remainder will be the numerator, and the diviſor the denominator to the fractional part.

EXAMPLES.

1. Reduce $\frac{43}{5}$ to a whole, or mixed number.

$$\begin{array}{l} 5)43(8\tfrac{3}{5} \text{ Anſwer.} \\ \underline{40} \\ 3 \end{array}$$

2. Reduce $\frac{61}{4}$ to a whole, or mixed number.
$15\frac{1}{4}$ Anſwer.

3. Reduce $\frac{103}{4}$ to a whole, or mixed number.
$25\frac{3}{4}$ Anſwer.

CASE IV. To reduce a compound fraction to a ſimple one.

RULE. Multiply all the numerators into each other for a new numerator, and all the denominators for a denominator.

Note. If part of a compound fraction be compoſed of a whole, or mixed number, it muſt be reduced to an improper fraction.

EXAMPLES.

1. Reduce $\frac{3}{4}$ of $\frac{1}{3}$ of $\frac{4}{5}$ to a ſimple fraction.

In this example, I ſay, 3 times 1 are 3, and 3 times 4 are 12, which is the new numerator; then 4 times 3 are 12, and 12 times 5 are 60, which is the new denominator; therefore the compound fraction, when reduced to a ſimple one, is, in its higheſt terms, $\frac{12}{60}$; but when reduced to its loweſt terms, it is $\frac{1}{5}$.

2. Reduce $\frac{1}{2}$ of $\frac{1}{3}$ of 8 to a ſimple fraction.
$\frac{8}{6}$ Anſ. and $\frac{8}{6}$ is $1\frac{1}{3}$.

3. Reduce $\frac{1}{9}$ of $\frac{7}{8}$ of $\frac{3}{5}$ to a ſimple fraction.
$\frac{21}{360}$ Anſ. and $\frac{21}{360}$ is $\frac{7}{120}$.

4. Reduce $\frac{5}{8}$ of $\frac{3}{4}$ of $7\frac{1}{3}$ to a ſimple fraction.
$\frac{330}{96}$ Anſ. and $\frac{330}{96}$ is $3\frac{7}{16}$.

5. Reduce $\frac{11}{12}$ of $\frac{9}{10}$ of $\frac{4}{5}$ of 7 to a ſimple fraction.
$\frac{2772}{600}$ Anſ. and $\frac{2772}{600}$ is $4\frac{31}{50}$.

6. Reduce $\frac{1}{8}$ of $\frac{3}{4}$ to a ſimple fraction. $\frac{3}{32}$ Anſwer.

CASE V. To reduce fractions of different denominators to equivalent fractions, having a common denominator.

RULE. Multiply the numerator of each fraction into all the denominators except its own, the product will be a new numerator for that fraction; thus proceed till you get a new numerator for each fraction. Then multiply all the denominators into each other; the product will be a common denominator, which being placed under each numerator will form the fractions required.

EXAMPLES.

1. Reduce $\frac{1}{5}$, $\frac{3}{4}$ and $\frac{2}{3}$ to a common denominator.

In this example, once 4 are 4, and 4 times 5 are 20, which is the new numerator for $\frac{1}{5}$; then, 3 times 3 are 9 and 9 times 5 are 45, the numerator for $\frac{3}{4}$; again, 2 times 4 are 8 and 8 times 3 are 24, the numerator for $\frac{2}{3}$; then 3 times 4 are 12 and 12 times 5 are 60, which is a common denominator to each new numerator, and being placed under them reſpectively, the fractions will ſtand thus, $\frac{20}{60}$, $\frac{45}{60}$, $\frac{24}{60}$.

2. Reduce $\frac{3}{8}$, $\frac{5}{6}$, $\frac{2}{3}$ and $\frac{9}{10}$ to a common denominator. $\frac{540}{1440}$, $\frac{1200}{1440}$, $\frac{960}{1440}$, $\frac{1296}{1440}$ Anſwer.

3. Reduce $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{11}{13}$ to a common denominator. $\frac{78}{104}$, $\frac{52}{104}$, $\frac{88}{104}$ Anſwer.

4. Reduce $\frac{4}{7}$ of $\frac{2}{3}$, $5\frac{1}{4}$ and $\frac{7}{9}$ to a common denominator. $\frac{288}{756}$, $\frac{3969}{756}$, $\frac{588}{756}$ Anſwer.

5. Reduce $\frac{8}{11}$ $\frac{7}{8}$, and $\frac{1}{5}$ of 6 to a common denominator. $\frac{320}{440}$, $\frac{385}{440}$, $\frac{528}{440}$ Anſwer.

CASE VI. To find the true value of any fraction, whether of coin, weight, or meaſure.

RULE. Multiply the integer by the numerator, and divide the product by the denominator; then if there be a remainder reduce it to the next lower denomination, and divide as before; thus proceed with every ſucceeding remainder till it is reduced to the loweſt denomination.

EXAMPLES.

1. What is the value of $\frac{2}{3}$ of a pound, or 20 ſhillings?

s.
20
2
— s. d.
3)40(13 4 Anſwer.
3
—
10

2. What is the value of $\frac{3}{8}$ of a pound?

s.
20
3
— s. d.
8)60(7 6 Anſwer.
56
—
4

(*Carried over.*

Brought over.)	10	4
	9	12
	1	8)48(6
	12	48
	3)12(4	
	12	

3. What is the value of $\frac{7}{9}$ of a pound ?
15s. 6d. 2$\frac{1}{3}$q. Anſ.

4. What is the value of $\frac{3}{5}$ of a dollar ? 60 cts. Anſ.

5. What is the value of $\frac{4}{5}$ of a lb Troy ?
9 oz. 12 pwt. Anſ.

6. What is the value of $\frac{2}{3}$ of a lb Avoirdupois ?
10 oz. 10$\frac{2}{3}$dr. Anſ.

7. What is the value of $\frac{3}{4}$ of 1 cwt. ? 84lb Anſ.

8. What is the value of $\frac{11}{13}$ of a pound ?
16s. 11$\frac{1}{13}$d. Anſ.

Case VII. To reduce the fraction of a low denomination to the fraction of a high denomination.

Rule. Reduce the integer of *that* denomination of which the fraction is *required*, to *that* of which the given fraction is a part ; then multiply by the denominator of the given fraction, and over the product place the numerator, and it will form the fraction required.

Examples.

1. Reduce $\frac{3}{4}$ of a penny to the fraction of a pound.

```
 s.
 20      3/960 Anſ. and 3/960 is 1/320.
 12
----
240
  4
----
960
```

2. Reduce $\frac{2}{3}$ of a penny to the fraction of a pound.
$\frac{1}{360}$ Anſwer.

3. Reduce $\frac{2}{3}$ of a farthing to the fraction of a ſhilling. $\frac{2}{144}$ Anſ. and $\frac{2}{144}$ is $\frac{1}{72}$.

4. Reduce $\frac{3}{5}$ of an inch to the fraction of a yard. $\frac{3}{180}$ Anſ. and $\frac{3}{180}$ is $\frac{1}{60}$.

5. Reduce $\frac{5}{8}$ of a foot to the fraction of a mile. $\frac{5}{42240}$ is $\frac{1}{8448}$ Anſ.

6. Reduce $\frac{1}{3}$ of a cent to the fraction of a dollar. $\frac{1}{300}$ Anſ.

7. Reduce $\frac{11}{12}$ of an ounce to the fraction of a pound Troy. $\frac{11}{144}$ Anſ.

8. Reduce $\frac{3}{7}$ of a dram to the fraction of a pound Avoirdupois. $\frac{3}{1792}$ Anſ.

9. Reduce $\frac{5}{9}$ of a pound avoirdupois to the fraction of 1 cwt. $\frac{5}{1008}$ Anſ.

CASE VIII. To reduce the fraction of a high denomination to the fraction of a low denomination.

RULE. Reduce the integer of *that* denomination of which the given fraction is a part, to *that* of which the fraction is *required*; then multiply by the numerator of the given fraction, and under the product place the denominator, and it will form a fraction, which when reduced to its loweſt terms will be the anſwer.

EXAMPLES.

1. Reduce $\frac{1}{320}$ of a pound to the fraction of a penny.

s.
20 $\frac{240}{320}$ and $\frac{240}{320}$ is $\frac{3}{4}$d. Anſ.
12
―――
240

Note. This caſe is the reverſe of Caſe VII. and therefore proves it.

2 Reduce $\frac{1}{480}$ of a pound to the fraction of a penny. $\frac{1}{2}$d. Anſwer.

3. Reduce $\frac{1}{72}$ of a ſhilling to the fraction of a farthing. $\frac{2}{3}$q. Anſwer.

4. Reduce $\frac{1}{60}$ of a yard to the fraction of an inch. $\frac{3}{5}$ Anſwer.

5. Reduce $\frac{1}{8448}$ of a mile to the fraction of a foot. $\frac{5}{8}$ Anſwer.

6. Reduce $\frac{1}{300}$ of a dollar to the fraction of a cent. $\frac{1}{3}$ Anſwer.

7. Reduce $\frac{11}{144}$ of a pound Troy to the fraction of an ounce. $\frac{11}{12}$ Anſwer.

8. Reduce $\frac{3}{1792}$ of a pound Avoirdupois to the fraction of a dram. $\frac{3}{7}$ Anſwer.

9. Reduce $\frac{5}{1008}$ of 1 cwt. to the fraction of a pound Avoirdupois. $\frac{5}{9}$ Anſwer.

Addition of Vulgar Fractions.

Rule. Mixed numbers muſt be reduced to improper fractions; compound fractions to ſimple ones; fractions of different denominations to thoſe of the ſame; then reduce the fractions to a common denominator, and add all the numerators together for a numerator, under which ſet the common denominator, and it will form a fraction, which when reduced to its loweſt terms will be the anſwer.

Examples.

1. Add $\frac{1}{3}$, $\frac{2}{5}$ and $\frac{3}{8}$ together.

In this example, I reduce the fractions to a common denominator, by Caſe V. thus, once 5 are 5 and 5 times 8 are 40, which is the numerator for $\frac{1}{3}$; then, 2 times 3 are 6, and 6 times 8 are 48, the numerator for $\frac{2}{5}$; again, 3 times 3 are 9, and 9 times 5 are 45, the numerator for $\frac{3}{8}$; then, 3 times 5 are 15, and 15 times 8 are 120, which is the common denominator; then write the common denominator under each new numerator, and the fractions appear thus, $\frac{40}{120}$, $\frac{48}{120}$, $\frac{45}{120}$; then, add all the numerators into one ſum, under which place the common denominator, and the fraction required, in its higheſt terms, ſtands thus, $\frac{133}{120}$, which is an improper fraction, but, being reduced to a whole, or mixed number, it appears thus, $1\frac{13}{120}$, the anſwer required.

2. Add $\frac{3}{5}$, $\frac{1}{9}$, $\frac{7}{11}$ and $\frac{1}{8}$ together. $1\frac{1871}{3960}$ Anſ.

3. Add $7\frac{4}{5}$, $\frac{5}{7}$ of $\frac{3}{8}$, and 7 together. $15\frac{19}{280}$ Anſ.

4. Add $\frac{1}{9}$ of a pound, $\frac{3}{7}$ of a ſhilling, and $\frac{4}{5}$ of a penny together. 2/8$\frac{64}{105}$ Anſ.

5. Add $\frac{3}{7}$ of $\frac{11}{15}$, and $\frac{1}{9}$ of $4\frac{1}{2}$ together. $\frac{57}{70}$ Anſ.

6. Add $\frac{1}{8}$ of a dollar, $\frac{2}{3}$ of a cent, and $\frac{7}{9}$ of a mill together. cents 13, $2\frac{4}{9}$ Anſ.

Subtraction of Vulgar Fractions.

Rule. Reduce the fractions to a common denominator, as in addition; then ſubtract one numerator from the other, and ſet the difference over the common denominator; the fraction, when reduced to its loweſt terms, will be the anſwer.

Examples.

1. From $\frac{3}{4}$ take $\frac{1}{3}$.

In this example, I reduce the fractions to a common denominator; which being done, the fractions ſtand thus, $\frac{9}{12}$, $\frac{4}{12}$; then, the difference of the numerators, which is 5, being placed over the common denominator, the fraction ſtands thus, $\frac{5}{12}$, which is the anſwer required.

2. From $\frac{5}{8}$ take $\frac{1}{9}$ of $\frac{2}{11}$. $\frac{479}{792}$ Anſwer.

3. From $\frac{2}{3}$ of a pound take $\frac{3}{4}$ of a ſhilling. 12/7 Anſ.

4. From $4\frac{1}{2}$ take $1\frac{4}{5}$. $2\frac{7}{10}$ Anſ.

5. From $\frac{10}{11}$ of a ℔ Troy take $\frac{3}{4}$ of a pwt. 10 oz. 17pwt. $10\frac{4}{11}$gr. Anſ.

6. From $\frac{23}{32}$ take $\frac{3}{5}$ of $\frac{1}{8}$. $\frac{103}{100}$ Anſ.

7. From $\frac{1}{3}$ of $2\frac{1}{2}$ take $\frac{1}{6}$ of $1\frac{3}{5}$. $\frac{51}{90}$ Anſ.

Note. A ſimple fraction may be ſubtracted from a whole number thus; ſubtract the numerator of the fraction from the denominator, and place the difference over the denominator; then take 1 from the whole number.

EXAMPLES.

	1	2	3
From	8	12	17
Take	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{11}{13}$
Anſ.	$7\frac{1}{4}$	$11\frac{1}{5}$	$16\frac{2}{13}$

4. From 24 dollars take $\frac{4}{5}$ of a dollar.
dol. $23\frac{1}{5}$; *or* 23, 20 Anſ.

5. From 14 pounds take $\frac{2}{3}$ of a pound.
£. $13\frac{1}{3}$; *or* 13 6 8 Anſ.

Multiplication of Vulgar Fractions.

RULE. Having reduced mixed numbers to improper fractions, and compound fractions to ſimple ones, multiply all the numerators into each other for the numerator, and all the denominators into each other for the denominator, of the fraction required; which fraction being reduced to its loweſt terms, is the anſwer.

EXAMPLES.

1. Multiply $\frac{11}{13}$ by $\frac{18}{49}$.

18	49	Then, $\frac{198}{637}$ Anſwer.
11	13	
18	147	
18	49	
198 numerator.	637 denominator.	

2. Multiply $\frac{3}{8}$, $\frac{7}{9}$, $\frac{8}{11}$, and $\frac{3}{5}$ together. $\frac{7}{55}$ Anſ.
3. What is the product of $\frac{5}{9}$, $\frac{9}{10}$, and $5\frac{3}{4}$? $2\frac{7}{8}$ Anſ.
4. Multiply $\frac{14}{15}$ of $\frac{21}{25}$, by $\frac{4}{5}$ of $\frac{13}{14}$. $\frac{2548}{4375}$ Anſ.
5. Multiply $8\frac{3}{4}$ by $\frac{1}{3}$ of $6\frac{1}{4}$. $18\frac{11}{48}$ Anſ.

To multiply a whole number by a fraction.

RULE. Multiply the whole number by the numerator of the fraction, and divide *that* product by the denominator; the quotient will be the product required.

EXAMPLES.

	1	2	3	4
Multiply	12	8	13	72
by	$\frac{3}{4}$	$\frac{3}{5}$	$\frac{2}{3}$	$\frac{7}{9}$
	4)36	5)24	3)26	9)504
Product	9	$4\frac{4}{5}$	$8\frac{2}{3}$	56

Note. When the numerator is 1, divide by the denominator only.

EXAMPLES.

	1	2	3	4
Multiply	16	19	28	75
by	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{7}$	$\frac{1}{12}$
Product	4	$9\frac{1}{2}$	4	$6\frac{3}{12}$ is $6\frac{1}{4}$

To multiply a whole, by a mixed number.

RULE. Multiply by the fractional part, as before directed; then multiply by the whole number; the ſum of the products will be the product required.

EXAMPLES.

	1	2	3
Multiply	15	24	45
by	$4\frac{2}{3}$	$8\frac{3}{5}$	$15\frac{3}{4}$
	3)30	5)72	4)135
	10	$14\frac{2}{5}$	$33\frac{3}{4}$
	60	192	225
			45
Product	70	$206\frac{2}{5}$	$708\frac{3}{4}$

Division of Vulgar Fractions.

Rule. Having reduced compound fractions to ſimple ones, and mixed numbers to improper fractions, multiply the numerator of the diviſor by the denominator of the dividend, the product will be the denominator of the quotient; then multiply the denominator of the diviſor by the numerator of the dividend, the product will be the numerator of the quotient, which being reduced to its loweſt terms will be the anſwer;—or, invert the diviſor, and then proceed as in multiplication of vulgar fractions.

Examples.

1. Divide $4\frac{3}{4}$ by $\frac{4}{5}$.
$4\frac{3}{4}$ is $\frac{19}{4}$; then, $\frac{4}{5})\frac{19}{4}(\frac{95}{16}$ quot. and $\frac{95}{16}$ is $5\frac{15}{16}$ Anſ.
2. Divide $\frac{1}{8}$ of $\frac{2}{3}$ by $\frac{1}{8}$ of $\frac{3}{4}$. $\frac{8}{9}$ Anſ.
3. Divide $\frac{1}{3}$ of 17 by $\frac{2}{3}$ of $\frac{3}{4}$. $11\frac{1}{3}$ Anſ.
4. Divide $\frac{15}{16}$ by $\frac{2}{3}$. $1\frac{13}{32}$ Anſ.
5. Divide $\frac{3}{8}$ by 7. $\frac{3}{56}$ Anſ.
6. Divide $145\frac{2}{5}$ by $\frac{1}{3}$ of $\frac{6}{7}$. $508\frac{27}{30}$ Anſ.

DECIMAL FRACTIONS.

Decimal fractions are wrought in the ſame manner as whole numbers, and are diſtinguiſhed from whole numbers by a comma* placed at the left hand; thus, ,25 ,75 ,258 ,7853 which are read twenty-five hundredths, ſeventy-five hundredths, two hundred and fifty-eight thouſandths, &c.

The denominator of a decimal fraction is always underſtood, it being 1, with ſo many cyphers at the right hand as there are figures in the numerator, that is, if the numerator be one figure only, it is ſo many tenths as there are units in the figure; if the numerator conſiſts of two places, it is ſo many hundredths; if three, ſo many thouſandths, &c. Thus, ,2 ,25 ,258 if expreſſed in the manner of vulgar fractions, would be $\frac{2}{10}$, $\frac{25}{100}$, $\frac{258}{1000}$, &c.

When there are more cyphers in the denominator, than there are places of figures in the numerator, the deficiency muſt be ſupplied by prefixing* a cypher, or cyphers, to the numerator; thus, $\frac{3}{100}$, $\frac{25}{1000}$, muſt be written, ,03 ,025, &c.

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* The comma, in decimal fractions, or the point which ſeparates a decimal fraction from a whole number, is called a Separatrix.

To enumerate any decimal, begin at the left hand figure, and proceed to the right. The firſt figure at the left hand, or the figure next to the comma, is called tens; the ſecond, hundreds; the third, thouſands, &c.; each figure, from left to right, *decreaſing* in the ſame proportion that whole numbers *increaſe* from right to left, as is ſhewn in the following Table.

TABLE.

,5	Tens, or tenth parts.
8	Hundreds, or hundredth parts.
6	Thouſands, or thouſandth parts.
7	Tens of thouſ. or ten thouſandth parts.
4	Hund. of thouſ. or hun. thouſandth parts.
8	Millions, or millionth parts.
3	Tens of millions, or ten millionth parts.
5	Hund. of mill. or hund. millionth parts.

Note. The firſt, ſecond, third, fourth, &c. places of decimals, reckoning from the left hand to the right, are called primes, ſeconds, thirds, fourths, fifths, &c.

From the above Table, it appears plain, that every figure, counting from left to right, *decreaſes* in a ten fold proportion; that is, the value of a figure, in the place of *hundreds*, is ten times *leſs* than the value of the ſame figure in the place of *tens*; and the value of a figure, in the place of *thouſands*, is ten times *leſs* than *that* of the ſame figure in the place of *hundreds*, &c. for, an *hundredth* part is ten times *leſs* than a *tenth* part, and a *thouſandth* part is ten times *leſs* than an *hundredth* part, &c.

The *annexing* of cyphers to a decimal fraction does neither *increaſe* nor *diminiſh* its value; for ,5, ,50 and ,500, that is, $\frac{5}{10}$, $\frac{50}{100}$, and $\frac{500}{1000}$, are all equivalent, being equal to $\frac{1}{2}$.

---

* When cyphers are to be placed at the left hand of any number, they are ſaid to be prefixed; but when they are to be placed at the right hand, they are ſaid to be annexed.

But, by *prefixing* cyphers to a decimal fraction, the value is *decreaſed*; for every cypher which is prefixed, renders the value of the fraction ten times *leſs* than it was before the cypher was prefixed; thus, ,5, ,05 and ,005 are of different values, as may be ſeen by expreſſing them in the manner of vulgar fractions; thus, ,5 is $\frac{5}{10}$; ,05 is $\frac{5}{100}$; ,005 is $\frac{5}{1000}$.

Addition of Decimals.

RULE. Whether the ſums to be added are mixed, or altogether decimals, place them in ſuch manner, as that each figure of every ſum may ſtand directly under thoſe of the ſame name; then proceed in every reſpect as in ſimple addition.

Point off ſo many places from the total ſum, for decimals, as there are decimals in the greateſt number added.

EXAMPLES.

1	2	3
84,5675	,85745	538,25
35,6332	,68379	375,025
13,0035	,53048	211,0025
31,6884	,00025	34,75
164,8926	2,07197	1159,0275

4	5
37856,25	35,6843
3572,523	587
485,3748	5438,284
24,15735	63479
41938,30515	69539,9683

6. What is the ſum of 85;385—848,25—,3085—28,75—3,4867 and ,835? 967,0152 Anſwer.

7. What is the ſum of 850—3,587—,5873—1,255 and ,79846? 856,22776 Anſwer.

8. What is the ſum of ,8536—7,75—81,113—583—,684 and 3,383? 676,7836 Anſwer.

9. What is the ſum of 4,25—5,075 and 7,0025? 16,3275 Anſwer.

Subtraction of Decimals.

Rule. Place the numbers as directed in addition of decimals; then ſubtract as in whole numbers, and from the remainder, point off ſo many places for decimals, as there are decimals in the greateſt number.

EXAMPLES.

	1	2	3
From	58,25	368,384	2,857
Take	31,75	59,0038	,98563
Rem.	26,50	309,3802	1,87137

4. From 73,583 take 49,876.	23,707 Anſwer.
5. From 3,75 take 1,8975.	1,8525 Anſwer.
6. From 1,5 take ,3785.	1,1215 Anſwer.
7. From ,9867 take ,0987.	,8880 Anſwer.

Multiplication of Decimals.

Rule. Proceed as in multiplication of whole numbers; then point off ſo many places of the product for decimals, as there are decimals in both the multiplicand and multiplier: but, if the product does not conſiſt of ſo many places, the deficiency muſt be ſupplied by prefixing cyphers.

EXAMPLES.

	1	2	3
Multiply	3,75	87,25	,5786
by	1,25	,389	3,75
	1875		
	750		
	375		
Product.	4,6875	33,94025	2,169750

4

,2536
,0372

5072
17752
7608

,00943392

In this example, the number of places in the product being *leſs* than the number of decimals in the multiplicand and multiplier, the defect is ſupplied by prefixing two cyphers.

5. Multiply 12,836 by ,354. 4,543944 Anſwer.
6. Multiply ,3785 by ,003. ,0011355 Anſwer.
7. Multiply 8,50 by 83,7. 711,450 Anſwer.
8. What is the product of ,00037 and ,0685? ,000025345 Anſwer.

Diviſion of Decimals.

Rule. Proceed as in diviſion of whole numbers; then point off ſo many places of the quotient for decimals, as the dividend has decimal places more than the diviſor.

Note 1. If there happen to be not ſo many places in the quotient as are required, prefix a ſufficient number of cyphers to make up the defect.

Note 2. When the decimal places of the diviſor are more than thoſe of the dividend, this defect muſt be ſupplied by annexing cyphers.*

Note 3. When there is a remainder, cyphers may be annexed to it, which render it capable of being further divided, and the ſucceeding figures in the quotient are decimals; which, by annexing a cypher, or cyphers, to every ſucceeding remainder, may be continued at pleaſure.

Note 4. When the dividend is a whole number, and the diviſor a decimal, annex ſo many cyphers to the dividend as there are decimal places in the diviſor; the quotient figures will be whole numbers till all the annexed cyphers are brought down and divided; then, if there be a remainder, annex a cypher or cyphers to it and divide; the remaining figures in the quotient will be decimals.

N. B. Four or five places of decimals are generally ſufficient.

Note 5. When the dividend is a decimal, and the diviſor a whole number, divide as in whole numbers till every figure of the dividend is brought down and divided; and if there are not ſo many places in the quotient as there are decimals in the dividend, ſupply the defect by prefixing a cypher or cyphers; and if there be a remainder, cyphers may be annexed, and the quotient carried on ſtill further.

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* When the dividend conſiſts of an integer only, or when it is a mixed number, if the decimal places of the diviſor be more than thoſe of the dividend, ſupply the defect by annexing cyphers to the integer, or decimal; the quotient figures will be whole numbers till all the annexed cyphers are brought down and divided; then, if there be a remainder, annex a cypher or cyphers, and divide; the remaining figures in the quotient will be decimals.

Note 6. When the dividend is a decimal, and the diviſor a whole number, if the diviſor is not contained in the dividend, place a cypher in the quotient in the firſt place; then, annex a cypher to the dividend, and if the diviſor is not contained in the dividend after *one* cypher is annexed, place another cypher in the quotient and annex another to the dividend; thus proceed till the dividend can be divided, and if there be a remainder, a cypher or cyphers may be annexed, and the quotient carried on ſtill further.

EXAMPLES.

1

2,75)23,30625(8,475 quotient.
2200
1306
1100
2062
1925
1375
1375

In this example, there being three places of decimals in the dividend *more* than in the diviſor, I point off the three right hand figures of the quotient, viz. 475 for decimals, according to the rule.

2

12),64896(,05408 quotient.
60
48
48
96
96

In this example, there being not ſo many places in the quotient as there are decimals in the dividend, the defect is ſupplied by prefixing one cypher, according to *Note* 1ſt.

3

,375)4,250(11,333 quot.
375
500
375
1250
1125
1250
1125
1250
1125
125

In this example, the dividend is 4,25; and ſince there are not ſo many places of decimals in the dividend as there are in the diviſor, I annex a cypher, according to *Note* 2d. Then, there being a remainder, I annex a cypher to it, and divide according to *Note* 3d, and point off the quotient for decimals; I proceed in the ſame manner with the two ſucceeding remainders; and finding every ſucceeding figure in the quotient, and conſequently every ſucceeding remainder to be the ſame, having gotten three places of decimals in the quotient, I ceaſe to divide any further. And here I would obſerve, that whenever there is a continual repetition of the ſame figure or figures of the quotient, by annexing a cypher or cyphers to every ſucceeding remainder, if the work were continued *forever*, the figures of the quotient, and likewiſe every ſucceeding remainder, would be uniformly the ſame.

4. Divide 34 by ,345.

```
,345) 34000(98,55+* quotient.
      3105
      ----
       2950
       2760
       ----
        1900
        1725
        ----
         1750
         1725
         ----
           25
```

In this example, the dividend being a whole number, I annex as many cyphers to it as there are places in the diviſor, according to *Note* 4th; the quotient figures are whole numbers till the cyphers are brought down and divided; then, there being a remainder, I annex a cypher to it, and point off the remaining figures of the quotient for decimals, as in Example 3d.

5. Divide ,985 by 75.

```
75) ,985(,01313+ quot.
     75
     --
     235
     225
     ---
      100
       75
      ---
       250
       225
       ---
        25
```

In this example, the dividend being a decimal, and the diviſor a whole number, I divide till every figure of the dividend is brought down; then, there being not ſo many places in the quotient as there are decimals in the dividend, the defect is ſupplied by prefixing a cypher; then, there being a remainder, I annex a cypher to it and divide, which carries the quotient to a greater degree of exactneſs. See *Note* 5th.

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* This character (+) ſignifies that the decimal is not complete, and that, by annexing cyphers to the remainder, it may be further increaſed.

6. Divide ,7 by 75.

75),700(,00933+quot.
675
———
250
225
———
250
225
———
25

In this example, the dividend being a decimal, and the diviſor a whole number, and the diviſor not being contained in the dividend, I place a cypher in the quotient in the firſt place, and then annex a cypher to the dividend, which being ſtill too ſmall, I place another cypher in the quotient, and annex another to the dividend: then proceed as in the other examples. See *Note* 6th.

7. Divide 7,735 by 3,25. 2,38 Anſwer.
8. Divide 18,3573 by ,748. 24,542+ Anſwer.
9. Divide ,68543 by 12,5. ,0548+ Anſwer.
10. Divide 753 by ,578. 1302,768+ Anſwer.
11. Divide 1,87 by 3,5. ,5342+ Anſwer.
12. Divide ,55736 by 48. ,01161+ Anſwer.
13. Divide 8,38 by ,666. 12,582+ Anſwer.
14. Divide 19 by ,333. 57,057+ Anſwer.
15. Divide ,00075 by ,0025. ,3 Anſwer.

Reduction of Decimals.

CASE I. To reduce a decimal to its loweſt terms.

RULE. When there are cyphers at the right hand of a decimal,* caſt them off; the decimal will then be in its loweſt terms.

EXAMPLES.

Reduce	to their loweſt terms.	Anſwers.
,756000		,756.
,250000		,25.
,7000		,7.
,5000		,5.

CASE II. To reduce decimals of different denominators to thoſe having the ſame denominator.

RULE. Annex ſo many cyphers to the *leaſt*, as ſhall make the number of places equal to the *greateſt*; the decimals will then have one common denominator.

---

* All decimals except thoſe which have cyphers at the right hand, are naturally in their loweſt terms.

EXAMPLES.

Reduce ,8—,75—,25—,378—,9875—,037 to a common denominator.

,8000—,7500—,2500—,3780—,9875—,0370 Anſwer.

CASE III. To reduce a vulgar fraction to a decimal.

RULE. Annex ſo many cyphers to the numerator as may be judged neceſſary;† then divide by the denominator; the quotient will be the decimal required.

Note. If there are not ſo many places in the quotient as there were cyphers annexed, the deficiency muſt be ſupplied by prefixing cyphers.

EXAMPLES.

1. Reduce $\frac{3}{4}$ to a decimal.

```
4)3,00
  ----
   ,75 Anſwer.
```

2. Reduce $\frac{12}{36}$ to a decimal.

```
36)12,000(,333+ Anſ.
   108
   ---
    120
    108
    ---
     120
     108
     ---
      12
```

3. Reduce $\frac{1}{8}$, $\frac{4}{5}$, $\frac{3}{7}$, $\frac{1}{2}$ and $\frac{8}{9}$ to decimals.
,125. ,8. ,428+ ,5. ,888+ Anſwers.

4. Reduce $\frac{9}{14}$, $\frac{1}{28}$, $\frac{2}{3}$, $\frac{1}{4}$ and $\frac{11}{27}$ to decimals.
,642+ ,0357+* ,666+ ,25. ,407+ Anſwers.

5. Reduce $\frac{3}{8}$, $\frac{22}{25}$, $\frac{1}{145}$ and $\frac{3}{43}$ to decimals.
,375. ,88. ,00689+* ,0697+* Anſwers.

CASE IV. To reduce a low denomination to the decimal of a high denomination.

RULE. Reduce the higheſt denomination to the loweſt mentioned, for a diviſor: then annex a competent number of cyphers to that of the low denomination, of which the decimal is required, and divide as in Caſe 3d ; the quotient will be the decimal required.

---

† When the denominator conſiſts of one place only, three cyphers are ſufficient.

*** In theſe examples, there being not ſo many places in the quotient as there were cyphers annexed, cyphers are prefixed.

Note. If there are not ſo many places in the quotient as there were cyphers annexed, ſupply the defect by prefixing cyphers.

Examples.

1. Reduce 1 farthing to the decimal of a pound.

s.
20
12
———
240
4
———
960

Then, 960)1,00000(,00104+ Anſwer.
960
———
4000
3840
———
160

2. Reduce 2 and 3 farthings to the decimals of a pound.
,00208+ ,003125 Anſwer.

3. Reduce 1, 2 and 3 farthings to to the decimals of a ſhilling.
,0208+ ,0416+ ,0625 Anſwer.

4. Reduce 1, 2 and 3 farthings to the decimals of a penny.
,25 ,5 ,75 Anſwer.

5. Reduce from 1 to 11 pence to the decimals of a pound.

1	2	3	4	5	6	
,00416+	,00833+	,0125	,0166+	,0208+	,025	Anſ.
7	8	9	10	11		
,02916+	,0333+	,0375	,0416+	,0458+		

6. Reduce from 1 to 11 pence to the decimals of a ſhilling.

1	2	3	4	5	6	
,083+	,166+	,25	,333+	,416+	,5	Anſ.
7	8	9	10	11		
,583+	,666+	,75	,833+	,916+		

Note. When ſhillings are to be reduced to the decimal of a pound, if the ſhillings be an *even* number, half the number, with a comma prefixed, is the decimal ; but if the number be *uneven*, annex a cypher to it, and then halve it as before.

Examples.

7. Reduce from 1 to 19 ſhillings to the decimals of a pound.

1	2	3	4	5	6	7	8	9	10	ſhillings.
,05	,1	,15	,2	,25	,3	,35	,4	,45	,5	decimals.

11	12	13	14	15	16	17	18	19	ſhillings.
,55	,6	,65	,7	,75	,8	,85	,9	,95	decimals.

8. Reduce 3 pwts. to the decimal of a pound troy.
,0125 Anſwer.

9. Reduce 4 ounces to the decimal of a ℔ avoirdupois.
,25 Anſwer.

10. Reduce 7℔ to the decimal of 1 cwt. ,0625 Anſwer.

11. Reduce 3 inches to the decimal of a yard.
,0833+ Anſwer.

12. Reduce 8 inches to the decimal of a foot.
,666+ Anſwer.

13. Reduce 10 inches to the decimal of a mile.
,0001578+ Anſwer.

14. Reduce 8 yards to the decimal of a mile.
,004545+ Anſwer.

15. Reduce 15 minutes to the decimal of an hour.
,25 Anſwer.

16. Reduce 18 hours to the decimal of a day. ,75 Anſ.

17. Reduce 65 days to the decimal of a year.
,178+ Anſwer.

Case V. To find the true value of any decimal, whether of coin, weight, or meaſure.

Rule. Multiply the given decimal by ſo many of the next lower denomination as make *one* in that denomination of which the given decimal is a part; then, point off ſo many places from the right hand of the product, as there are places in the given decimal; the left hand figures are whole numbers; then multiply the figures, which were pointed off, by the parts of the next lower denomination, and point off as before; thus proceed through every deſcending denomination; the figures at the left hand of the ſeveral products determine the value of the decimal.

Examples.

1. What is the value of ,5956 of a pound?

,5956
20 ſhillings in a pound. s. d.
11 $10\frac{3}{4}$ Anſwer.
s. 11,9120
12 pence in a ſhilling.
d. 10,9440
4 farthings in a penny.
q. 3,7760

2. What is the value of ,384 of a ſhilling ? 4½d. Anſ.

3. What is the value of ,9345 of a pound Troy ?
11 oz. 4 pwt. 6 gr. Anſwer.

4. What is the value of ,75254 of a mile ?
240 rod. 4 yds. 1 ft. 4 in. 2 bar. Anſwer.

5. What is the value of ,857 of a day ?
20 h. 34 m. 4 s. Anſwer.

6. What is the value of ,75 of a year ?
273 d. 18 h. Anſwer.

SINGLE RULE OF THREE DIRECT;

OR,

DIRECT PROPORTION.

In the Single Rule of Three Direct, there are three numbers given, to find a fourth number, which ſhall be to the third, as the ſecond is to the firſt ; or, in other words, which ſhall be in proportion to the third, as the ſecond is in proportion to the firſt.

When *more* requires *more*, or *leſs* requires *leſs*, the queſtion is in direct proportion.

When *more* requires *more*, the third term is greater than the firſt, and then the fourth term, or anſwer, is greater than the ſecond term. When *leſs* requires *leſs*, the third term is leſs than the firſt, and then the fourth number, or anſwer, is leſs than the ſecond term.

Rule. In ſtating a queſtion, that number, which is of the ſame name with the anſwer required, muſt be the *ſecond* term.

That number, which aſks the queſtion, muſt be the *third* term.

That number, which is of the ſame name with the third term, muſt be the *firſt* term.

Note 1. The *firſt* and *third* terms muſt always be of the ſame name and denomination.

Note 2. If the ſecond, or middle term conſiſt of more than one denomination, it muſt be reduced to the loweſt mentioned.

Having properly ſtated the queſtion, multiply the ſecond and third terms into each other, and divide the product by the firſt term ; the quotient will be the anſwer, or number ſought.

Note 3. The anſwer always comes in the ſame denomination with the middle term, which, if it be a low denomination, muſt be reduced to the higheſt poſſible.

Note 4. The proportion between the terms, in the Single Rule of Three, is thus expreſſed, viz. As the firſt term is to the ſecond, ſo is the third to the anſwer required. As 1 : 2 :: 3 : 6.

EXAMPLES.

1. If 5 yards of cloth coſt 15 dollars, what will 20 yards coſt at that rate?

yds. dol. yds.
As 5 : 15 :: 20
20

5)300(60 dol. Anſ.
30

0

2. If 20 yards of cloth coſt 60 dollars, what will 5 yards of the ſame coſt?

yds. dol. yds.
As 20 : 60 :: 5
5

20)300(15 dol. Anſ.
20

100
100

3. If 15 dollars buy 5 yards of cloth; how many yards will 60 dollars buy?

dol. yds. dol.
As 15 : 5 :: 60
60

15)300(20 yds. Anſ.
30

0

4. If 60 dollars buy 20 yds of cloth; how many yards will 15 dollars buy?

dol. yds. dol.
As 60 : 20 :: 15
15

100
20

60)300(5 yds. Anſ.
300

The four firſt queſtions are the ſame, but differently varied and are a proof to each other.

Here it may be obſerved, that, in all the above examples, th firſt and third terms of each ſtatement, are of the ſame nam and denomination, and that the anſwer is of the ſame nam with the ſecond or middle term, according to the Rule.

5. If 9 yards coſt £.10 16; what will 63 yards coſt at that rate?

```
   yds.  £.  s.     yds.
As 9  :  10  16  ::  63
         20
        ———
        216

    yds.   s.     yds.
Then, as 9 : 216 :: 63
                63
               ———
               648
              1296
             —————    20  £.  s.
           9)13608(1512(75  12. Anſ.
             9      140
             —      ———
             46     112
             45     100
             —      ———
             10      12
              9
             ——
             18
             18
             ——
```

In this example, there being two denominations in the middle term, I reduce it to the loweſt, which is ſhillings; then ſtate the queſtion, and proceed, as in the firſt examples.

Here, the anſwer comes in a low denomination, viz. ſhillings, which I reduce to a high denomination, viz. to pounds and ſhillings, which muſt always be done in like caſes.

6. If 2/3 will buy 3 yards of ribbon; how many yards will 15/9 buy?

```
   s. d.  yds.    s. d.
As 2  3 :  3  :: 15  9
   12             12
   ——            ———
   27            189

        d.  yds.  d.
Then, as 27 : 3 :: 189
                     3
                   ———
            27)567(21 yds. Anſ.
                54
                ——
                27
                27
                ——
```

In this example, there being two denominations in the firſt and third terms, I reduce them* to the loweſt mentioned, viz. to pence; I then ſtate the queſtion, and proceed, as in the other examples.

---

* When the firſt or third terms conſiſt of more than one denomination, they muſt both be reduced to the loweſt mentioned, before the queſtion is ſtated.

7. If 8 yards of cloth coſt 12 dollars; what will 32 yards of the ſame coſt?

```
     yds.   dol.    yds.   dol.
As    8  :  12   ::  32  :  48 Anſwer.
```

8. If 72 yards coſt £.71 8; what will 9 yards coſt?

```
        yds.  £.  s.   yds.  £.  s.  d.
As       72  :  71  8 ::  9  :  8  18  6 Anſwer.
```

9. If £.60 15 buy 54 yards of cloth; how many yards of the ſame will £.10 2 6 buy? 9 yds. Anſwer.

Note 1. When the firſt and third terms are federal money, but of different denominations, reduce them to the loweſt mentioned, and proceed as in whole numbers.

Note. 2. When the middle term is federal money, proceed as in whole numbers, without reſpect to denomination, till after you have divided; then, if the middle term be dollars and cents, * point off the two right hand figures of the quotient for cents, the left hand figures are dollars; but, if the middle term conſiſt of cents and mills, or dollars, cents and mills point off the firſt right hand figure of the quotient for mills, the two next for cents, the remaining figures on the left hand are dollars.

10. If 1 dollar, 50 cents buy 3 yards of linen; how many yards will 16 dollars buy?

```
     cts.   yds.   cts.
As   150  :  3  ::  1600
            1600
            ----
            1800
               3
            ----
     150)4800(32 yds. Anſ.
         450
         ---
          300
          300
          ---
```

11. If 8 yards of cloth coſt dol. 16, 98, 4; what will 96 yds. of the ſame cloth coſt?

```
   yds. dol. ct. m.   yds.
As  8  :  16, 98, 4 :: 96
                       96
               -------
               101904
              152856
              -------  dol. ct. m.
            8)1630464(203,80,8 Anſ.
              16
              --
                30
                24
                --
                 64
                 64
                 --
                  64
                  64
                  --
```

---

* When the middle term is dollars and cents only, if there be a remainder after dividing, annex a cypher to it, and divide; the quotient will be mills.

12. If 13 yards of cloth coſt 39 dollars; how many yards of the ſame may be bought for 156 dollars? 52 yds. Anſ.

13. A man bought 36 yards of cloth for 108 dollars, and ſold the ſame at 4 dollars per yard; did he gain, or loſe, and how much? Gained 36 dol. Anſ.

14. If 7 yards of ribbon coſt 6/8; what will 42 yards coſt at that rate? £.2 Anſ.

15. A man bought 3 packs of cloth; each pack contained 25 yards. For the firſt pack he gave 75 dollars; for the ſecond, 50 dollars; and for the third, 37 dollars, 50 cents; he ſold the whole at the rate of 2 dollars, 50 cents per yard; did he gain, or loſe, and how much? Gained 25 dol. Anſ.

16. If a man earn 64 dollars in 4 months; how long muſt he work to earn 304 dollars? 19 months Anſ.

17. If an ounce of ſilver be worth 1 dollar, 10 cents; what is the value of 5 ſilver ſpoons; each weighing 1 oz. 4 pwt.? dol. 6, 60 Anſ.

18. If 8¾ yards coſt 4 dollars, 20 cents; what will 13½ yards coſt? dol. 6, 48 Anſ.

19. A owes B 798 dollars; but A not being worth ſo much money, B agrees to take 80 cents on the dollar; what ſum muſt B receive for the whole debt? dol. 638, 40 Anſ.

20. A man owes £.693; but is worth only £.462; what muſt each creditor receive on the pound? 13/4 Anſ.

21. If a third of ſix be three,
What will a fourth of twenty be? 7½ Anſ.

22. If 95 yards coſt 23 dollars, 75 cents; what will 16 yards coſt? 4 dol. Anſ.

23. If 3℔ of tobacco coſt 37 cents, 5 mills; how much of the ſame may be bought for 3 dollars, 12 cents, 5 mills? 25℔ Anſ.

24. A tub, which holds 130 gallons, is ſupplied by a pipe which admits 16 gallons into it in 30 minutes; it alſo has a leak in the bottom, which lets out 10 gallons in the ſame time. Now if the water begin to come into the tub, when it is empty, in what time will it be filled? 10 h. 50 m. Anſ.

25. Suppoſe my income be £.135 16 8 per year; how much may I ſpend per day, in order to lay up £.75 at the year's end? 3/4 per day. Anſ.

26. A man bought 72 yards of cloth for 216 dollars, and ſold it in ſuch manner as gained 36 dollars; what did he give per yard, and how did he ſell it per yard?

3 dollars, gave per yard.
3 dollars, 50 cents, ſold it per yd. } Anſwer.

Note. The above queſtion requires two different ſtatements, as is frequently the caſe; and ſometimes a queſtion requires three or more ſtatements.

27. A man bought 27 yards of cloth for 86 dollars, 40 cents, and ſold it in ſuch manner as gained 20 dollars, 25 cents; what did it coſt per yard—how did he ſell it per yard—and how much did he gain per yard?

dol. 3, 20 coſt per yard.
3, 95 ſold it per yard.
0, 75 gained per yard. } Anſwer.

28. If 6ſ. Maſſachuſetts money be equal to 8ſ. New-York money; how much York money muſt be given for £.100 Maſſachuſetts? £.133 6 8 Anſ.

29. If a ſtaff, which is 3 feet long, caſt a ſhadow which meaſures 9 feet; how high is a tree whoſe ſhadow, at the ſame time, meaſures 285 feet? 95 feet. Anſ.

30. A ſhip has a leak, which will fill it, ſo as to ſink in 7 hours; it likewiſe has a pump, which will clear it in 12 hours. Now, if they begin to pump, when it begins to leak, in what time will it ſink?

From 12
Take 7
Rem. 5

h. h. h. h. m.
Then, at 5 : 7 :: 12 : 16 48 Anſwer.

31. If $\frac{4}{5}$ of a ship cost 12580 dollars; what is her whole value?

dol. dol.
As 4 : 12580 :: 5 : 15725 Anſwer.

32. If a ship cost 13595 dollars; what is $\frac{3}{7}$ of her value?

dol. dol. cts. m.
As 7 : 13595 :: 3 : 5826, 42, 8$\frac{4}{7}$ Answer.

33. A man bought $\frac{3}{16}$ of an acre of land, for which he gave 84 dollars; what was the acre valued at? 448 dol. Anſ.

34. A man bought a barrel of rum, containing 28 gallons, for 6 ſhillings per gallon; but, by a leak in the caſk, he loſt 7 gallons. How muſt he ſell what was ſaved per gallon, ſo as not to loſe? 8ſ. Anſ.

35. A man bought 1600lb. of tobacco ; but after it was cut and dried, it weighed only 1400lb ; what did it loſe per pound ? 2 ounces. Anſwer.

36. A gentleman bought 85 hogſheads of rum in the Weſt-Indies, for 30 dollars per hogſhead. The coſt of tranſportation was 20 cents per hogſhead. His own time he valued at 40 dollars, and his other expenſes were 60 dollars. Now, I demand how he muſt ſell his rum per hogſhead, in order to clear 850 dollars ? dol. 41, 37, 6 Anſwer.

37. If I buy a barrel of cider, containing 32 gallons, for £.1 4, and ſell it at 4 pence per quart ; do I gain or loſe, and how much ? I gain 18/8 Anſwer.

38. Suppoſe a tax of 879 dollars, 45 cents, be laid on a town, and the value of all the eſtates in the town amount to 175890 dollars ; what muſt a man pay, whoſe eſtate is valued at 896 dollars ? dol. 4, 48. Anſ.

SINGLE RULE OF THREE INVERSE;

OR,

INDIRECT PROPORTION.

In the ſingle Rule of Three Inverſe, there are three numbers given, to find a fourth, which ſhall be in proportion to the ſecond, as the firſt is to the third.

When *more* requires *leſs*, or *leſs* requires *more*, the queſtion belongs to the Single Rule of Three Inverſe.

When *more* requires *leſs*, the third term is greater than the firſt ; and then the fourth number or anſwer required, muſt be *leſs* than the ſecond, or middle term. When *leſs* requires *more*, the third term is leſs than the firſt ; and then the fourth number, or anſwer required, muſt be *greater* than the ſecond, or middle term.

Rule. Having reduced the firſt and third terms to one denomination, and the ſecond, or middle term, to the loweſt denomination mentioned, ſtate the queſtion as in the Single Rule of Three Direct ; then, multiply the firſt and ſecond terms together, and divide the product by the third term ; the quotient will be the anſwer.

EXAMPLES.

1. If 6 men do a piece of work in 18 days; in what time will 12 men do it?

m. d. m.

As 6 ∶ 18 ∷ 12

6

12) 108(9 days. Anſ.

108

2. If 12 men do a piece of work in 9 days; how long will it take 6 men to do the ſame work?

m. d. m.

As 12 ∶ 9 ∷ 6

12

6) 108(18 days. Anſ.

6

48

48

3. Suppoſe I would line 8 yards of broadcloth, which is $1\frac{1}{2}$ yard wide, with ſhalloon that is $\frac{3}{4}$ of a yard wide; how many yards of ſhalloon will be ſufficient?

$1\frac{1}{2}$ yard is 6 quarters; then, qrs. yds. qrs. yds.

As 6 ∶ 8 ∷ 3 ∶ 16 Anſ.

4. How much cloth that is $\frac{1}{2}$ yard wide, will it take to line another piece of cloth, which is $9\frac{1}{2}$ yards long, and $1\frac{1}{4}$ yard wide? $23\frac{3}{4}$ yards. Anſwer.

5. How long will it take 5 men to do the ſame work which 37 men can do in 15 days? 111 days. Anſwer.

6. If a man perform a journey in 18 days, by travelling 15 hours per day; how long will it take him to perform the ſame journey, by travelling only 12 hours per day? $22\frac{1}{2}$ days. Anſ.

7. A ciſtern is ſupplied by a pipe which will fill it in 3 hours; how many pipes of the ſame bigneſs will fill it in 30 minutes? 6 pipes. Anſ.

8. Suppoſe I lend a friend 480 dollars for 3 months, he promiſing the like kindneſs; but, when requeſted, can let me have only 96 dollars; how long may I keep it to balance the favour? 15 months. Anſ.

9. How many ſquares of glaſs, 6 by 8, will make a ſquare foot? in. ſq. in. ſq.

As 144 ∶ 1 ∷ 48 ∶ 3 Anſ.

Note. The anſwer to any queſtion, in the Single Rule of Three, whether *direct* or *inverſe*, may be found by the following rule.

RULE. Make that number, which is of the ſame name as the anſwer required, the middle term. Call the *firſt* and *third* terms the *extremes*. Then, conſider whether the anſwer muſt be *greater* or *leſs* than the middle term. If the anſwer muſt be *greater* than the middle term, multiply the middle term by the greateſt extreme, and divide the product by the leaſt ; but, if the anſwer muſt be *leſs* than the middle term, multiply the middle term by the leaſt extreme, and divide the product by the greateſt ; in either caſe the quotient will be the anſwer.

10. How many men muſt be employed to do the ſame work in 15 days, which 5 men can do in 111 days ? 37 men. Anſ.

11. If a piece of land be 40 rods long ; how wide muſt it be in order to contain 5 acres ? rod. A. rod. rod.
As 160 : 5 :: 40 : 20 Anſ.

12. How much in length, that is 10 rods wide, will make an acre ? rod. A. rod. rod.
As 160 : 1 :: 10 : 16 Anſwer.

DOUBLE RULE OF THREE;

OR,

COMPOUND PROPORTION.

In the Double Rule of Three there are five numbers given to find a ſixth, which (if the proportion be direct) ſhall be in proportion to the fourth and fifth, as the third is to the firſt and ſecond ; but, if the proportion be inverſe, the ſixth number, or anſwer required, will be in proportion to the fourth and fifth, as the firſt is to the ſecond and third.

Rule. State the queſtion by making that number, which is the *cauſe* of gain, loſs, or action, the firſt term. That number, which denotes *time* or *diſtance*, muſt be the ſecond term. That number, which *is* the gain, loſs, or action, muſt be the third term. The other two numbers in the queſtion muſt be placed directly under thoſe of the ſame name. Then, if the blank fall under the third term, multiply the third, fourth and fifth terms into each other for a dividend, and the firſt and ſecond for a diviſor ; the quotient will be the anſwer. But, if the blank fall under the firſt or ſecond term, multiply the firſt, ſecond, and fifth terms into each other for a dividend, and the third and fourth for a diviſor ; the quotient will be the anſwer.

Note 1. When the blank falls under the *third* term, the proportion is *direct* ; but, when it falls under the *firſt* or *ſecond* term, the proportion is *inverſe*.

Note 2. Before a queſtion can be properly ſtated, each term in the ſtatement muſt be reduced to the loweſt denomination mentioned.

EXAMPLES.

1. If 100 dollars gain 6 dollars in one year; what will 900 dollars gain in 8 months?

```
 dol.   mo.   dol.
 100 :  12 :: 6
 900 :   8
         6
        ——
 100    48
  12    900
 ———   ———
1200 ) 43200(36 dol. Anſ.
       3600
       ————
        7200
        7200
        ————
```

In this example, the blank falls under the third term;* therefore the proportion is direct. I multiply the three laſt terms together for a dividend, and the two firſt for a diviſor; the quotient is the anſwer.

2. If 100 dollars gain 6 dollars in one year; in what time will 900 dollars gain 36 dollars?

```
dol.   mo.    dol.
100 :  12 ::   6
900 :     ::  36
  6           12
————         ————
5400          432
              100
             ————
      5400)43200(8 mo. Anſ.
           43200
           —————
```

In this example, the blank, falling under the ſecond term, the proportion is inverſe; therefore I multiply the firſt, ſecond, and fifth terms together for a dividend, and the third and fourth for a diviſor; the quotient is the anſwer.

3. If 100 dollars gain 6 dollars in one year; what principal will gain 36 dollars in 8 months?

```
dol.   mo.    dol.
100 :  12 ::  6
        8 ::  36—900 dol. Anſwer.
```

---

* The anſwer always comes in the ſame name, with that term, under which the blank falls.

4. If 900 dollars gain 36 dollars in 8 months, what is the rate per cent.; or, in other words, what will 100 dollars gain in one year?

dol. mo. dol.
900 : 8 :: 36
100 : 12 6 dol. Anſwer.

5. If 900 dollars gain 36 dollars in 8 months; in what time will 100 dollars gain 6 dollars?

dol. mo. dol.
900 : 8 :: 36
100 : :: 6—12 months. Anſwer.

6. If it coſt 60 dollars to cart one ton 150 miles; how much will it coſt to cart 5 tons 25 miles?

T. M. T.
1 : 150 :: 60
5 : 25 50 dol. Anſwer.

7. A gentleman lent a certain ſum of money for 3 months, to receive intereſt at 6 per cent.; at the end of the time he received 12 dollars for the uſe of his money; what was the ſum lent? 800 dol. Anſwer.

8. If it coſt 50 dollars to cart 5 tons 25 miles; how far muſt one ton be carted, in order to have the coſt amount to 60 dollars? 150 miles. Anſwer

9. A gentleman lent 1200 dollars for a certain time, to receive intereſt at 6 per cent.; at the expiration of the time he received 30 dollars intereſt; what time was his money lent?
5 months. Anſwer.

10. What principal, at 6 per cent. will gain 1 dollar in an hour, allowing 365 days make a complete year?
146000 dol. Anſwer.

11. If 800 dollars gain 12 dollars in 3 months; in what time will 50 cents gain 1 dollar? 33 yrs. 4 mo. Anſwer.

12. If it coſt £.3 12 to paſture 2 cows 3 months; what will it coſt to paſture 8 cows 5 months? £.24. Anſwer.

FELLOWSHIP.

FELLOWSHIP is a Rule by which ſeveral perſons trading in company may diſcover their particular ſhares of the gain or loſs in proportion to their ſeveral ſtocks.

Single Fellowſhip

Is, when the ſtock of each partner is continued in trade a certain equal time.

Rule. Add all the particular ſtocks into one ſum; then, as the ſum of all the ſtocks is to the whole gain or loſs, ſo is each man's particular ſtock to his ſhare of the gain or loſs.

Proof. Add all the ſhares of the gain or loſs into one ſum; if it be equal to the whole gain or loſs, the work is right.

Examples.

1. A, B, and C trade in company. A put into the ſtock 400 dollars, B put in 300 dollars, and C put in 200 dollars; they gained 270 dollars; what is each man's ſhare of the gain, in proportion to what he put in?

dol.	
400	A's ſtock.
300	B's ſtock.
200	C's ſtock.

As 900 : 270 :: 400

400

900)108000(120 dol. A's gain.

900

1800

1800

0

As 900 : 270 :: 300

300

900) 81000 (90 dol. B's gain.

8100

0

As 900 : 270 :: 200

200

900)54000(60 dol. C's gain.

5400

0

dol.	
120	A's gain.
90	B's gain.
60	C's gain.
270	Proof.

2. A, B, C, and D trade together. A put in 800 dollars, B put in 500 dollars, C put in 300 dollars, and D 150 dollars; but by misfortune they loſt 350 dollars; what muſt each ſuſtain of the loſs?

dol.		
160	A's loſs.	Anſwer.
100	B's —	
60	C's —	
30	D's —	

3. A gentleman dying, left two ſons and a daughter, to whom he bequeathed the following ſums, viz. To the firſt ſon

he gave 1200 dollars, to the ſecond 1000 dollars, and to the daughter, 800 dollars; but it was found that his whole eſtate amounted only to 750 dollars; what muſt each child receive of the eſtate, in proportion to the legacies?

dol. 300 firſt ſon's portion.
250 ſecond ſon's portion. Anſwer.
200 daughter's portion.

4. A, B, and C trade in partnerſhip. A put in 385 dollars, 50 cents; B put in 297 dollars, 75 cents; and C put in 175 dollars, 25 cents; they gained 343 dollars, 40 cents; what is each one's ſhare of the gain?

dol. 154, 20 A's gain.
119, 10 B's —— Anſwer.
70, 10 C's ——

5. A and B trade together; A put in 540 dollars, B put in a ſum unknown; they gained 387 dollars, of which B took 225 dollars for his ſhare; what is A's gain, and what did B put in?

387 Then, as 162 : 540 :: 225 : 750 dol. B's ſtock.
225
——
162 A's gain.

6. A, B, and C trade in company. A's ſtock is £.75 18; B's ſtock is £.58 10; C's ſtock is £.40; they gained £.58 2 8. What is each one's ſhare of the gain?

£.25 6 0 A's gain.
19 10 0 B's —— Anſwer.
13 6 8 C's ——

7. A, B, and C bought a ſhip, for which they gave 3000 dollars. A paid 2850 dollars, B paid 1980 dollars; and C the reſt; by a voyage at ſea, they cleared 6400 dollars; what is each man's ſhare of the gain, in proportion to what each paid for the ſhip.

dol. 2280 A's gain.
1584 B's —— Anſwer.
2536 C's ——

8. A, B, and C trade together. A put in 300 dollars, B put in 250 dollars, and C put in 120 yards of broadcloth; they gain 412 dollars, of which C's ſhare was 192 dollars; what is A's and B's gain, and what was C's cloth valued at?

dol. 120 A's gain.
100 B's gain. Anſwer.
480 value of C's cloth.

9. A, B, and C trade in company. A put in 520 dollars, B put in 450 dollars, and C 360 dollars; they gained at the rate of 25 per cent.; what is each one's ſhare of the gain?

		dol. ct.	
As 100 : 25 ::	520 :	130, 00 A's gain.	Anſwer.
	450 :	112, 50 B's ——	
	360 :	90, 00 C's ——	

Double Fellowſhip.

Double Fellowſhip is, when the ſtocks of ſeveral perſons, trading in company, are continued in trade unequal times.

Rule. Multiply each man's ſtock by the time it was in trade, and add all the products into one ſum; then, as the ſum of all the products is to the whole gain or loſs, ſo is each man's product to his ſhare of the gain or loſs.

Examples.

1. A, B, and C trade in company. A put in 400 dollars for 9 months; B put in 300 dollars for 6 months; C put in 200 dollars for 5 months; they gained 320 dollars; what is each man's ſhare of the gain?

400 300 200
9 6 5
3600 A's pr. 1800 1000
1800 B's pr.
1000 C's pr.
6400

As 6400 : 320 :: 3600
3600
192000
960
dol.
6400)1152000(180 A's gain.
6400
51200
51200
0

As 6400 : 320 :: 1800
1800
256000
320
dol.
6400)576000(90 B's gain.
57600
0

As 6400 : 320 :: 1000
1000
dol.
6400)320000(50 C's gain.
32000
0

dol. 180 A's gain.
90 B's gain.
50 C's gain.
320 Proof.

2. A, B, and C trade in partnerſhip. A put in 500 dollars for 18 months; B put in 380 dollars for 13 months; C put in 270 dollars for 9 months; they loſt 818 dollars, 50 cents; what is each man's loſs?

dol. 450, 00 A's loſs.
247, 00 B's —— Anſwer.
121, 50 C's ——

3. On the firſt of January, A began trade with 380 dollars, and on the firſt of May following, he took in B with 270 dollars; on the firſt of Auguſt following, he took in C with 400 dollars; at the end of the year, they found there were gained 436 dollars; what was each man's ſhare of the gain?

dol. 228 A's gain.
108 B's —— Anſwer.
100 C's ——

4. A and B enter into partnerſhip for one year. A, at firſt, put in 500 dollars, and at the end of 5 months he put in 150 dollars more. B, at firſt, put in 600 dollars, and at the end of 9 months he took out 200 dollars; at the year's end, there were gained 682 dollars, 50 cents; what is each man's ſhare of the gain?

dol. 352, 50 A's gain.
330, 00 B's —— Anſwer.

5. A and B trade in company. A, on the firſt of January, put in 420 dollars; but B could not put in any till the firſt of April; what muſt he then put in to have an equal ſhare with A, at the year's end?

mo. dol. mo. dol.
As 12 : 420 :: 9 : 560 Anſwer.

Simple Intereſt.

INTEREST is a ſum allowed by the *borrower* to the *lender*, according to a certain rate per cent. which, by law, is eſtabliſhed at 6 per cent. that is, 6 pounds or dollars, for the uſe of 100 pounds or dollars, for one year.

Principal is the ſum lent.

Rate is the ſum allowed for the uſe of 100 dollars or pounds, for one year.

When the intereſt and principal are added together, the ſum is called the *amount*.

Case I. To find the intereſt of any ſum for one year, when the principal is in lawful money.*

Rule. Multiply the principal by the rate per cent.; then, cut off the two right hand figures of the higheſt denomination; reduce the two right hand figures which were cut off from the higheſt denomination, to the next lower denomination, and cut off as before; thus proceed to reduce and cut off, till you have brought it to the loweſt denomination. The figures at the left hand of each denomination, determine the intereſt of the ſum for one year.

Note. To find the intereſt for any number of years, multiply the intereſt of one year by the number of years; the product will be the anſwer.

EXAMPLES.

1. What is the intereſt of £.486 10 8, for 1 year, at 6 per cent?

£. s. d.
486 10 8
6
29|19 4 0
20
3|84
12
10|08
4
|32 £. s. d. 29 3 10 Anſ.

2. What is the intereſt of £.58 13 4, for 1 year, at 5 per cent?

£. s. d.
58 13 4
5
2|93 6 8
20
18|66
12
8|00 £. s. d. 2 18 8 Anſ.

3. What is the intereſt of £.120 6 8½ for 5 years, at 6 per cent?

£. s. d.
120 6 8½
6
7|22 0 3
20
4|40
12
4|83 7 4 4¾ Intereſt for 1 year.
4 5
3|32 £.36 1 11¾ Intereſt for 5 years.

---

* Although the rules for finding the intereſt of any ſum, for any given time, when the principal is in lawful money, will apply to federal money, yet particular rules will be given hereafter.

QUESTIONS. ANSWERS.

	Principal.			Time.	Rate.	Intereſt.		
	£.	s.	d.			£.	s.	d.
4.	675	8	6	for 1 year,	at 6 per cent.	40	10	6.
5.	300	13	4	for 3	6	54	2	4½.
6.	42	17	3	for 4	5	8	11	5.
7.	13	3	4½	for 1	6	0	15	9½.
8.	144	10	0	for 1	6	8	13	4¾.
9.	18	16	8¼	for 3	5	2	16	6.
10.	16	8	4	for 1	4½.	0	14	9¼.
11.	1	0	0	for 1	6	0	1	2¼.

CASE II. To find the intereſt of any ſum, for any number of months, when the rate is 6 per cent.

RULE. Multiply the principal by half the number of months, and cut off, as in Caſe 1ſt.

EXAMPLES.

1. What is the intereſt of £.48 10 6 for 8 months, at 6 per cent?

```
 £.  s.  d.
 48  10  6
          4
 -----------
1|94   2  0
   20
 -----
18|82
   12
 -----
 9|84
    4
 -----      £.  s.  d.
 3|36       1  18  9¾ Anſwer.
```

2. What is the intereſt of £.36 18 4 for 7 months, at 6 per cent?

```
 £.   s.  d.
 36   18  4
          3½
 -----------
110   15  0
 18    9  2
 -----------
1|29   4  2
   20
 -----
 5|84
   12
 -----      £.  s.  d.
10|10       1   5  10 Anſ.
```

3. What is the intereſt of £.24 15 4½ for 10 months, at 6 per cent? £.1 4 9¼ Anſwer.

4. What is the intereſt of £.13 3 4 for 6 months, at 6 per cent? £.0 7 10¾ Anſwer.

5. What is the intereſt of £.10 8 6 for 15 months, at 6 per cent? £.0 15 7½ Anſwer.

6. What is the intereſt of £.5 16 3 for 18 months, at 6 per cent? £.0 10 5½ Anſwer.

7. What is the intereſt of £.3 14 7 for 11 months, at 6 per cent? £.0 4 1¼ Anſwer.

8. What is the intereſt of £.9 6 8 for 20 months, at 6 per cent? £.0 18 8 Anſwer.

CASE III. Intereſt for months, when the rate is *more* or *leſs* than 6 per cent.; likewiſe, intereſt for weeks and days, at any rate per cent. may be found by the Double Rule of Three:

EXAMPLES.

1. What is the intereſt of £.24 for 8 months, at 5 per cent?

£. mo. £.
100 : 12 :: 5
24 : 8
5
40
24
100 160
12 80
1200 960
20
1200) 19200(16*l.* Anſwer.
1200
7200
7200

2. What is the intereſt of £.18 for 5 weeks, at 6 per cent?

£. w. £.
100 : 52 :: 6
18 : 5
6
30
18
240
30
52 540
100 20
s. d.
5200) 10800(2 0¾ Anſwer.
10400
400
12
5200)4800(0
4
5200)19200(3
15600
3600

8. What is the intereſt of £.400 for 73 days, at 6 per cent.?

```
       £.    days.  £.
      100 : 365 :: 6
      400 :  73
              6
          ------
  365       438
   100      400
  -----   -------  £.  s.
  36500 ) 175200 ( 4  16 Anſwer.
          146000
          ------
           29200
              20
          ------
  36500 ) 584000(16
           36500
          ------
          219000
          219000
          ------
```

To find the intereſt of any ſum, the principal being in federal money.

Case. I. When the principal is dollars only, to find the intereſt for one year.

Rule. Multiply the principal by the rate per cent.; then, cut off the two right hand figures of the product for cents; the left hand figures are dollars.

Examples.

1. What is the intereſt of 345 dollars for 1 year, at 6 per cent?

```
      dol.
      345
        6
      -----
dol. 20,70 Anſwer.
```

2. What is the intereſt of 125 dollars for 1 year, at 5 per cent?

```
      dol.
      125
        5
      ----
dol. 6,25 Anſwer.
```

3. What is the intereſt of 480 dollars for 1 year, at 6 per cent? dol. 28, 80 Anſwer.

4. What is the intereſt of 320 dollars for 4 years, at 6 per cent? dol. 76, 80 Anſwer.

5. What is the intereſt of 17 dollars for 1 year, at 6 per cent? dol. 1, 02 Anſwer.

6. What is the intereſt of 139 dollars for 2 years, at 6 per cent? dol. 16, 68 Anſwer.

7. What is the intereſt of 48 dollars for 3 years, at 3 per cent? dol. 4, 32 Anſwer.

Case II. To find the intereſt for one year, when the principal is dollars and cents, or cents only.

Rule. Multiply the principal by the rate per cent.; then cut off the firſt right hand figure of the product, which is to be conſidered as *nothing;* then point off the firſt right hand figure for mills, the two next for cents; the figures remaining on the left hand are dollars.

Examples.

1. What is the intereſt of 85 dollars, 75 cents for 1 year, at 6 per cent?

dol. ct.
85, 75
6
dol. 5,14,5|0 Anſwer.

2. What is the intereſt of 24 dollars, 50 cents for 1 year, at 6 per cent?

dol. ct.
24, 50
6
dol. 1,47,0|0

3. What is the intereſt of 48 dollars, 25 cents for 1 year, at 6 per cent? dol. 2, 89, 5 Anſwer.

4. What is the intereſt of 25 dollars, 66 cents for 4 years,* at 6 per cent? dol. 6, 15, 8 Anſwer.

5. What is the intereſt of 387 dollars, 84 cents for 3 years, at 6 per cent? dol. 69, 81, 1 Anſwer.

Case III. To find the intereſt for 1 year, when the principal is cents and mills, or dollars, cents and mills.

Rule. Multiply the principal by the rate per cent.; then cut off the two right hand figures of the product, which are to be conſidered as *nothing;* this being done, point off the firſt right hand figure for mills, the two next for cents; the figures remaining on the left hand are dollars.

Examples.

1. What is the intereſt of 146 dollars, 75 cents, 6 mills for 1 year, at 6 per cent?

dol. ct. m.
146, 75, 6
6
dol. 8, 80, 5|36 Anſwer.

2. What is the intereſt of 87 dollars, 33 cents, 7 mills for 1 year, at 8 per cent?

dol. ct. m.
87, 33, 7
8
dol. 6, 98, 6|96 Anſwer.

---

*To find the intereſt for any number of years, multiply by the rate per cent; that product by the number of years; then cut off as the rule directs. —NOTE. This rule applies to Caſe III.

3. What is the intereſt of 95 dollars, 50 cents, 3 mills, for 1 year, at 6 per cent ? dol. 5, 73, 0 Anſwer.

4. What is the intereſt of 24 dollars, 84 cents, 9 mills, for 3 years, at 6 per cent ? dol. 4, 47, 2 Anſwer.

5. What is the intereſt of 48 dollars, 25 cents, 5 mills, for 5 years, at 5 per cent ? dol. 12, 06, 3 Anſwer.

6. What is the intereſt of 359 dollars, 12 cents, 3 mills, for 1 year, at 6 per cent ? dol. 21, 54, 7 Anſwer.

7. What is the intereſt of 75 cents, 5 mills, for 4 years, at 6 per cent ? cents 18, 1 Anſwer.

Case IV. To find the intereſt for any number of months, when the principal is dollars only, and the rate 6 per cent.

Rule. Divide the principal by 2, and multiply the quotient by the given number of months ; then point off the two right hand figures of the product for cents ; the left hand figures are dollars.

Examples.

1. What is the intereſt of 398 dollars for 9 months, at 6 per cent ?

dol.
2) 398
199
9
dol. 17, 91 Anſwer.

2. What is the intereſt of 453 dollars for 5 months, at 6 per cent ?

dol.
2) 453
$226\frac{1}{2}$
5
dol. 11, $32\frac{1}{2}$ Anſwer.

3. What is the intereſt of 48 dollars for 7 months, at 6 per cent ? dol. 1, 68 Anſwer.

4. What is the intereſt of 750 dollars for 15 months, at 6 per cent ? dol. 56, 25 Anſwer.

5. What is the intereſt of 185 dollars for 11 months, at 6 per cent ? dol. 10, $17\frac{1}{2}$ Anſwer.

6. What is the intereſt of 124 dollars for 3 months, at 6 per cent ? dol. 1, 86 Anſwer.

7. What is the intereſt of 97 dollars for 4 months, at 6 per cent ? dol. 1, 94 Anſwer.

Case V. To find the intereſt for any number of months, when the principal is dollars and cents, or cents only, and the rate 6 per cent.

Rule. Divide the principal by 2, and multiply the quotient by the given number of months; then cut off the firſt right hand figure of the product, with the fraction if there be any, which is to be conſidered as *nothing*; this being done, point off the firſt right hand figure for mills, the two next for cents; the remaining figures on the left hand are dollars.

Examples.

1. What is the intereſt of 24 dollars, 50 cents, for 6 months, at 6 per cent?

```
      dol. ct.
    2) 24,50
    --------
       12 25
           6
    --------
cents 73,5|0 Anſwer.
```

2. What is the intereſt of 84 dollars, 25 cents for 7 months, at 6 per cent?

```
      dol. ct.
    2) 84,25
    --------
      42 12½
           7
    --------
dol. 2,94,8|7½ Anſwer.
```

3. What is the intereſt of 175 dollars, 66 cents for 9 months, at 6 per cent? dol. 7, 90, 4 Anſwer.

4. What is the intereſt of 8 dollars, 75 cents, for 18 months, at 6 per cent? cents 78, 7 Anſwer.

5. What is the intereſt of 19 dollars, 20 cents for 3 months, at 6 per cent? cents 28, 8 Anſwer.

6. What is the intereſt of 36 dollars, 84 cents for 5 months, at 6 per cent? cents 92, 1 Anſwer.

Case VI. To find the intereſt for any number of months, when the principal is dollars, cents, and mills, or cents and mills only, and the rate 6 per cent.

Rule. Divide the principal by 2, and multiply the quotient by the given number of months; then cut off the two right hand figures of the product, which are to be conſidered as *nothing*; this being done, point off the firſt right hand figure for mills, the two next for cents; the remaining figures on the left hand are dollars.

EXAMPLES.

1. What is the intereſt of 125 dollars, 68 cents, 4 mills, for 5 months, at 6 per cent ?

dol. ct. m.
2)125,68,4

62 84 2
5

dol. 3,14,2|10 Anſwer.

2. What is the intereſt of 75 dollars, 50 cents, 7 mills, for 9 months, at 6 per cent ?

dol. ct. m.
2)75,50,7

37 75 3½
9

dol. 3,39,7,81½ Anſwer.

3. What is the intereſt of 356 dollars, 33 cents, 6 mills, for 4 months, at 6 per cent ? dol. 7, 12, 6 Anſwer.

4. What is the intereſt of 66 cents, 4 mills, for 19 months, at 6 per cent ? cents 6, 3 Anſwer.

5. What is the intereſt of 48 dollars, 84 cents, 9 mills, for 8 months, at 6 per cent ? dol. 1, 95, 3 Anſwer.

6. What is the intereſt of 4 dollars, 08 cents, 6 mills, for 16 months, at 6 per cent ? cents 32, 6 Anſwer.

7. What is the intereſt of 158 dollars, 09 cents, 5 mills, for 7 months, at 6 per cent ? dol. 5, 53, 3 Anſwer.

CASE VII. To find the intereſt of any ſum, for any number of days, when the rate is 6 per cent.

RULE. Multiply the principal by the number of days, and divide the product by 6083 ; the quotient (when pointed off as directed in diviſion of federal money) will be the intereſt required.

EXAMPLES.

1. What is the intereſt of 400 dollars for 73 days, at 6 per cent ?

days.
73
400

dol. ct.
6083)29200(4, 80 Anſwer.
24332

486800
48664

160

2. What is the intereſt of 125 dollars, 75 cents, 6 mills, for 40 days, at 6 per cent ?

dol. ct. m.
125,75,6
40

ct. m.
6083)503 02 40(82, 6 Anſ.
486 64

16 38 4
12 16 6

4 21 80
3 64 98

56 82

3. What is the intereſt of 346 dollars, 50 cents for 6 days, at 6 per cent? dol. 3, 41, 7 Anſwer.

4. What is the intereſt of 890 dollars for 5 days, at 6 pe cent? cents 73, 1 Anſwer.

5. What is the intereſt of 48 dollars, 25 cents, 7 mills fo 23 days, at 6 per cent? cents 18, 2 Anſwer.

6. What is the intereſt of 25 dollars for 280 days, at per cent? dol. 1, 15 Anſwer.

Compound Intereſt.

Compound Intereſt is, when the intereſt is added to th principal every year ſucceſſively.

Rule. Find the intereſt of the firſt year (by Simple Intereſt) and add it to the principal; the amount is the principa for the ſecond year; thus proceed for every ſucceeding year then, having found the amount for the given number of years ſubtract the firſt principal therefrom, the remainder is th compound intereſt.

Examples.

1. What is the compound intereſt of 680 dollars for years, at 6 per cent?

dol.	
680	principal for the 1ſt year,
6	
40,80	intereſt of ditto.
680	principal for the 1ſt year.
40,80	intereſt of ditto.
720,80	principal for the 2d year.
6	
43,24,8|0	intereſt of ditto.
720,80	principal for the 2d year
43,24,8	intereſt of ditto.
764,04,8	principal for the 3d year.
6	
45,84,2|88	intereſt of ditto.

[Carried over

Bro't over.] 764,04,8 principal for the 3d year.
45,84,2 intereſt of ditto.

809,89,0 principal for the 4th year.
6

48,59,3|40 intereſt of ditto.

809,89,0 principal for the 4th year.
48,59,3 intereſt of ditto.

858,48,3 amount for 4 years.
ſubtract 680,00,0 principal for the 1ſt year.
remainder 178,48,3 compound intereſt.

2. What is the compound intereſt of 1000 dollars for 5 years, at 6 per cent? dol. 338, 22, 4 Anſwer.

3. What is the compound intereſt of 480 dollars for 4 years, at 6 per cent? dol. 125, 98, 8 Anſwer.

4. What is the compound intereſt of 400 pounds for 5 years, at 4 per cent? £.86 13 2 Anſwer.

LOSS AND GAIN.

Loss and Gain is a rule, by which merchants diſcover their profit or loſs per cent. It likewiſe teaches them to fix the price of their goods, in order to gain or loſe a certain rate per cent.

Case I. When goods are bought at one price and ſold at another, to find the gain or loſs per cent.

Rule. Find the gain or loſs per yard, pound, &c. by ſubtraction; then (by direct proportion) as the price it coſt is to the gain or loſs per yard, pound, &c. ſo is a 100 pounds or dollars to the gain or loſs per cent.

Examples.

1. If cloth be bought for 6 ſhillings per yard, and ſold at 7 ſhillings and 6 pence, what is gained per cent?

s. d.
Sold for 7 6
coſt 6 0

gain 1 6 per yd.

6*ſ.* are 72 pence.
1/6 are 18 pence.

d. d. £.
Then, as 72 : 18 :: 100
100

72)1800(25*l.* Anſ.
144

360
360

Note. The firſt and ſecond terms muſt be of the ſame name and denomination.

2. If cloth be bought for 7 ſhillings and 6 pence per yard, and ſold at 6 ſhillings per yard, what is loſt per cent?

s. d.
coſt 7 6
ſold 6 0
loſs 1 6 per yd.

d. d. £.
Then, as 90 : 18 :: 100
100
90)1800(20*l.* Anſ.
180
0

3. If I buy cloth for 2 dollars per yard, and ſell it for 2 dollars, 50 cents per yard, what do I gain per cent. or by laying out 100 dollars?

dol. ct.
ſold 2,50
coſt 2,00
gained 0,50 per yd.

ct. ct. dol.
As 200 : 50 :: 100
100
dol.
200)5000(25 Anſwer.
400
1000
1000

4. If I buy cloth for 4 dollars per yard, and ſell it for 5 dollars per yard, what do I gain per cent? dol. 25 Anſwer.

5 If I buy ribbon at 8 pence per yard, and ſell it at 1 ſhilling per yard, what do I gain per cent? £. 50 Anſwer.

6. If I buy cloth for 2 dollars, 50 cents per yard, and ſell it for 2 dollars per yard, what do I loſe per cent?
dol. 25 Anſwer.

7. At 15 cents profit in the dollar, how much per cent?
dol. 15 Anſwer.

8. At 4 mills profit in the cent, how much per cent?
dol. 40 Anſwer.

9. At 2 pence profit in the ſhilling, how much per cent?
£.16 13 4 Anſwer.

10. At 3 ſhillings profit in the pound, how much per cent?
£.15 Anſwer.

11. Suppoſe I buy 47 yards of cloth for 141 dollars, and

ſell it for 3 dollars, 75 cents per yard, do I gain or loſe, and how much per cent.?

47)141(3 dol. coſt per yard.
141
—
dol. ct.
ſold 3, 75
coſt 3, 00
gained 0, 75 per yard.

dol. ct. dol. dol.
As 3 : 75 :: 100 : 25 Anſwer.

Case. II. To fix the price upon goods, in order to gain or loſe a certain rate per cent.

Rule. As 100 pounds,* or dollars, is to the price it coſt, ſo is 100 pounds or dollars, with the gain per cent. added, or loſs per cent. ſubtracted, to the price for which the article muſt be ſold, in order to gain or loſe the propoſed rate per cent.

EXAMPLES.

1. If I buy cloth for 6 ſhillings per yard, how muſt I ſell it per yard, ſo as to gain £.25 per cent?

£. s. £.
As 100 : 6 :: 125
6
100)750(7/6 Anſ.
700
50
12
100)600(6
600

2. If I buy flour for 8 dollars per barrel, how muſt I ſell it per barrel, in order to gain 50 dollars per cent?

dol. dol. dol.
As 100 : 8 :: 150
8
100)1200(12 dol. Anſ.
1200

3. If I buy cloth for 7/6 per yd. how muſt I ſell it per yd. ſo as to loſe 20 per cent?

£. d. £.
As 100 : 90 :: 80
80
100)7200(72*d.* are 6*ſ.* Anſ.
700
200
200

4. If I buy cloth for 3 dollars per yard, how muſt I ſell it per yard to loſe 10 dollars per cent?

dol. dol. dol.
As 100 : 3 :: 90
90
dol. 2,70 Anſwer.

---

* In this Caſe, the firſt and third terms muſt be of the ſame name and denomination.

5. Suppoſe I buy 1 cwt. of cotton for 28 dollars, how muſt I ſell it per pound, to gain 50 dollars per cent ?

112)28,00(25 cts. coſt per pound.

dol. cts. dol. cts. m.
Then, as 100 ∶ 25 ∷ 150 ∶ 37, 5 Anſwer.

6. If I buy ribbon for 1 ſhilling per yard, how muſt I ſell it per yard to gain £.33 6 8 per cent ? 1/4 Anſwer.

7. If thread coſt 1 cent per ſkein, how muſt it be ſold per ſkein to gain 50 dollars per cent ? cents 1, 5 Anſwer.

8. Bought a quantity of fiſh, for 20 ſhillings per quintal ; but, it being damaged, I am willing to loſe £.15 per cent. ; how muſt I ſell it per quintal ? 17ſ. Anſwer,

9. If cloth coſt 2 dollars per yard, how muſt it be ſold per yard to gain 25 dollars per cent ? dol. 2, 50 Anſwer.

10. If I buy land for 3 dollars per acre, how muſt I ſell it per acre to gain 75 dollars per cent ? dol. 5, 25 Anſwer.

Particular Rules.

Having the length and breadth of a piece of land given in rods, to find how many acres it contains.

Rule. Multiply the length and breadth together, and divide the product by 160 ; the quotient will be acres, and the remainder, (if there be any) will be rods.

Examples.

1. How many acres in a piece of land 40 rods long, and 30 wide ?

40
30
A. rods.
160)1200(7 80 Anſwer ; Or, 7½ acres
1120
80

2. How many acres in a piece of land 120 rods long, and 48 wide ? 36 acres. Anſwer.

Having the length and breadth of any ſurface given in feet, yards, &c. to find how many ſquare feet, yards, &c. it contains.

Rule. Multiply the length and breadth together ; the product will be the anſwer in feet, yards, &c.

EXAMPLES.

1. How many ſquare feet are there in a floor which is 18 feet long, and 14 wide?

18
14
72
18
252 ſquare feet. Anſwer.

2. How many ſquare feet in a table which is 9 feet long, and 4 wide? 36 Anſwer.

3. How many ſquare yards are there in a garden which is 45 yards long, and 33 yards wide? 1485 Anſwer.

Having the length and breadth of any ſurface given in feet and inches, to find how many ſquare feet it contains.

RULE. In the firſt place, reduce them to inches; then multiply the length and breadth together, and divide the product by 144, the quotient will be ſquare feet, and the remainder (if there be any) will be inches.

EXAMPLES.

1. How many ſquare feet in a board which is 12 feet 8 inches long, and 1 foot, 4 inches wide?

ft.	in.	ft.	in.
12	8	1	4
12		12	
152 in. long.		16 in. wide.	

Then, 152
16
912
152
ft. in.
144)2432(16 128 Anſ.
144
992
864
128

2. How many ſquare feet in a table 5 feet long, and 3 feet, 6 inches wide?

60 inches long.
42 inches wide.
120
240
ft. in.
144)2520(17 72 Anſwer.
144
1080
1008
72

Or thus, 5
3½
2½
15
17½ Anſ.

Having the length, breadth and thickneſs of any ſolid body given, to find its contents.

Rule. Multiply the length, breadth and thickneſs into each other, the product will be the anſwer.

Examples.

1. How many ſolid or cubic feet are there in a ſtick of timber, which is 9 feet long, 2 feet wide, 1½ foot thick?

9
2

18
1½

18
9

27 Answer.

2. How many ſolid or cubic feet in a body of hay, which is 35 feet high, 23 wide and 15 thick? 12085 Anſwer.

To reduce pounds to dollars, cents, &c.

Rule. Annex one cypher to the pounds, and divide by three; the quotient will be dollars; then, if there be a remainder, annex two cyphers to it and divide; the quotient will be cents; and, if there ſtill be a remainder, annex one cypher and divide; the quotient will be mills.

N. B. Separate mills from cents, and cents from dollars, by a comma.

Examples.

1. Reduce 37 pounds to dollars, cents, &c.

3)370

dol. 123,33,3 Anſwer.

Or, you may annex four cyphers to the pounds, and divide by 3; then point off the firſt right hand figure of the quotient for mills, the two next for cents, the left hand figures are dollars.

2. Reduce 45 pounds to dollars, cents, &c.

3)450000

dol. 150,00,0 Anſwer.

To reduce dollars to pounds, ſhillings, &c.

Rule. Multiply the dollars by 3, and double the unit figure of the product for ſhillings; the other figures are pounds.

Examples.

1. Reduce 356 dollars to pounds.

dol.
356
3

£.106 16 Anſwer.

2. Reduce 180 dollars to pounds.

dol.
180
3

£.54 0 Anſwer.

A TABLE,

Reducing the ſhillings, pence and farthings of New-England, to dollars, cents and mills.

		ct.m.	d.	ct.m.	ſ.	dol. ct. m.	ſ.	dol. ct. m.
farthings.	1	00, 3	6	08, 3	1	0, 16, 7	11	1, 83, 3
	2	00, 7	7	09, 7	2	0, 33, 3	12	2, 00, 0
	3	01, 0	8	11, 1	3	0, 50, 0	13	2, 16, 7
Pence.	1	01, 4	9	12, 5	4	0, 66, 7	14	2, 33, 3
	2	02, 8	10	13, 9	5	0, 83, 3	15	2, 50, 0
	3	04, 2	11	15, 3	6	1, 00, 0	16	2, 66, 7
	4	05, 6	12	16, 7	7	1, 16, 7	17	2, 83, 3
	5	06, 9			8	1, 33, 3	18	3, 00, 0
					9	1, 50, 0	19	3, 16, 7
					10	1, 66, 7	20	3, 33, 3

Book-Keeping.

Solomon Thornton of Randolph, *Dr.*

1798.		*dols. cts.*
Feb. 3.	To 8 buſhels wheat, at 1,66 cts.	13, 28
9.	To 29℔ beef, at 6½ cts.	1, 88½
17.	To 3 buſhels rye, at 1,50 cts.	4, 50
20.	To 5 buſhels potatoes, at 25 cts.	1, 25
25.	To 10 pair of ſhoes, at 1,75 cts.	17, 50
March 8.	To 75℔ cheeſe, at 10 cts.	7, 50
12.	To 3 thouſand of clear boards, at 13 dols. a thouſand.	39, 00
18.	To 7 cords oak wood, at 3 dols.	21, 00
25.	To 4 days' work done by myſelf and 1 yoke of oxen, at 1,40 cts.	5, 60
May 7.	To 28 yds. tow-cloth, at 22 cts.	6, 16
15.	To 19℔ butter, at 20 cts.	3, 80
June 5.	To 2 days' work at hoeing, done by myſelf, at 83 cts. a day.	1, 66
29.	To 7℔ pork, at 18½ cts.	1, 29½
Sept. 25.	To 9 barrels of cider, at 1,33 cts.	11, 97
		136, 40
	Settled October 15, 1798.	

to *Walter Underwood*, *Cr.*

1798.		dols.	cts.
March 8.	By 4 buſh. ſalt, at 75 cts.	3,	00
12.	By 1¾ cwt. flour, at 6 dols. per cwt.	10,	50
19.	By 3 gal. W. I. rum, at 1,50 cts.	4,	50
28.	By 18 yds. of linen, at 40 cts.	7,	20
April 2.	By 10℔ ſugar at 15 cts.	1,	50
9.	By 2 pieces nankeen, at 1,25 cts.	2,	50
15.	By a ſide of ſoal-leather, weighing 28℔ at 20 cents.	5,	60
23.	By 12 yds. broadcloth, at 4,50 cts.	54,	00
29.	By 3 qts. Sherry wine, at 35 cts.	1,	05
May 5.	By 4 doz. waiſtcoat buttons, at 67 cts. a dozen.	2,	68
23.	By ½ cwt. of rice, at 3,34 cts.	1,	67
July 5.	By a braſs kettle, weighing 25℔, at 50 cts. per pound.	12,	50
Oct. 15.	By caſh to balance.	29,	70
		136,	40

October 15, 1798. Settled all book accounts heretofore contracted between us.

Walter Underwood.
Solomon Thornton.

A TABLE,

In which the gold coins of Great-Britain and Portugal are reduced to an equivalent value in dollars and cents.

gr.	*ct.*	*gr.*	*ct.*	*pwt.*	*dol.ct.*	*pwt.*	*dol.ct.*
1	3	13	48	1	0, 89	11	9, 78
2	7	14	51	2	1, 78	12	10, 67
3	11	15	55	3	2, 67	13	11, 55
4	14	16	59	4	3, 55	14	12, 44
5	18	17	63	5	4, 44	15	13, 33
6	22	18	67	6	5, 33	16	14, 22
7	25	19	70	7	6, 22	17	15, 11
8	29	20	74	8	7, 11	18	16, 00
9	33	21	78	9	8, 00	19	16, 89
10	37	22	81	10	8, 89	20	17, 78
11	40	23	85				
12	44						

A TABLE,

In which the gold coins of France and Spain are reduced to an equivalent value in dollars and cents.

gr.	*ct.*	*gr.*	*ct.*	*pwt.*	*dol.ct.*	*pwt.*	*dol.ct.*
1	3	13	47	1	0, 87	11	9, 63
2	7	14	51	2	1, 75	12	10, 51
3	11	15	55	3	2, 63	13	11, 39
4	14	16	58	4	3, 50	14	12, 26
5	18	17	62	5	4, 38	15	13, 14
6	22	18	66	6	5, 25	16	14, 01
7	25	19	69	7	6, 13	17	14, 89
8	29	20	73	8	7, 01	18	15, 76
9	33	21	76	9	7, 88	19	16, 64
10	36	22	80	10	8, 76	20	17, 52
11	40	23	84				
12	44						

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